TECHNOLOGY

approach

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THE NAVAL AVIATION SAFETY REVIEW

June 1959

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approach for June 1959

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LETTERS

Tape Tips

Sir:

During my last tour I was Hangar Deck Officer of the USS LEYTE and with the stepped up night operations, hangar deck "crashes" became more frequent. I went into a huddle with Supply and they were able to obtain, through open purchase, a supply of reflective tape. This was applied to the tip of the vertical stabilizer, the most prominent projection in the wingfold, to the tip of the horizontal stabilizer and the axles. It was also placed on all prominent projections on the hangar deck and flight deck. It was amazing how these "streaks" stood out in the light of a flashlight. Yours for fewer hangar accidents—

R. A. HOLMES, III
LCDR, USN, Fitron 13

Fail-Safe Advocate

Sir:

Your article "Sparing the Rod" in the March issue of APPROACH discusses common instances of throttle linkage failure due to missing nuts and bolts. Corrective action recommended seems to be largely confined to closer inspection. You ask your readers if they can improve upon the suggested preventative measures.

The answer is yes. Let's get off the maintenance crew's backs for a moment and try to get under BuAer's skin! And the manufacturers' skin too. We design some planes so that when linkage failure occurs the fuel flow is automatically *reduced* and the pilot *loses all power*—same as automobiles. In the air this is embarrassing, in the landing circle it is annoying to say the least, and on takeoff, it's down right disastrous. This smacks of the old sink-or-swim attitude—you're OK while swimming but when you quit, you s i n k. Fortunately progressive thought has provided pilots with life jackets to keep them afloat when they quit swimming. Can't our designers become progressive enough to spring-load the fuel system *right from the start* to give at least sustaining power when the linkage comes apart? A simple "fail-safe" device?

Yes, I know, corrective action has been taken in some cases, the FJ in particular, and our FJ's are finally being rigged up with fail-safe devices. But this is March 1959 and our first FJ accident from provable linkage failure occurred in March 1956. A fail-safe device was urged at that time and in the subsequent time 5 similar accidents we have had.

Now how about other aircraft types? No. 7 brief in the F4D Safety Center Analyst's 5 March "Dear Safety Officer" letter indicates the same problem area in the F4D. Must we start all over again destroying a certain number of aircraft before a fail-safe device is provided? Let's get BuAer and the manufacturers to include a fail-safe device in *initial* designs so that when a pilot "forgets" to tighten his friction lock or a mech "forgets" to safety wire the nuts and bolts, the pilot will still have at least half a chance to do something. And let's not take another 3 years to retrofit applicable current types.

COLONEL, USMC

Jenny Starter

Sir:

To preclude the hazard of the crank striking the operator during the starting process we are now installing an electric starter on the hydraulic jenny engine.

We recently had one severe case where the crank remained engaged and struck a mechanic in the left eye.

R. P. EVANS
Safety Officer
VS-36

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U.S. Naval Aviation Safety Center.

Creeping Line

Sir:

Re "No Time for Study"
(March 1959)

Your "scientifically" correct search area (P9) is incorrect if the radius of a circle is equal to one half the diameter! The correct search area should be 60 miles wide by approximately 100 miles long rather than 30 miles by 60 miles as suggested in the text. Figures 7-11b and 7-18b of NWP-37 support the larger area. By definition R_1 is the search radius for the first search and R_1 at BASS is 23 miles. Hence if the pilot were down 16 miles north of BASS (excluding parachute and raft drift) he would be missed if the recommended search width of 30 miles was oriented 15 miles on either side of the BASS-INTREPID line of bearing.

Should not the dispatch or message to the OSC contain the width of the creeping line? The SAR Mission Coordinator had best get more search aircraft airborne or else the final calculation on page 11 will indicate a false sense of security.

E. S. FRITZ, LCDR, USN
Staff, ComCarDiv SIX
USS SARATOGA (CVA-60)

● **The error is acknowledged. As far as we know the diameter of a circle is still two times the radius! Glad that you and others made a practice run of the checkoff list. As regards the creeping line the inclusion of its width certainly would be advantageous to the OSC.**

Feathering Heights

Sir:

Your article Feb. '59 page 36 concerning a follow-up inspection on an S2F states "During practice feathering at 4000' . . . " It appears that the general precautionary rule in OpNav Instr 3710.7A Sect. VIII, para 1 e was violated unless the aircraft was undergoing test and trials required by BuAer. The information may lead some pilot not so familiar with 3710.7A to practice feathering at 4000' or lower. The 6000' altitude was put there for a reason.

H. R. PURDY, LT,
NAF ANNAPOLIS

SPEED TRAP

ALTHOUGH the jet had touched down safely it was headed for trouble. Seconds before, as the lights of the big A3D swept down out of a low, damp overcast onto the runway the pilot had attempted to deploy the drag chute. The slowing action of that parachute billowing at the tail often made the difference between a landing rollout under positive control or a nerve-jangling stop somewhere near the end of the runway. But this time there was no sudden tug from a ballooning drag chute—it had fouled.

Now the speed which was so necessary and comforting in the air was unwelcome—doubly unwelcome at night on this wet runway, thought the pilot. A light drizzle blurred the runway lights and as he pressed down on the brake pedals he could see faintly the green lights marking the end of the runway. There was a slight deceleration from the brakes but not enough to effect a stop on the runway.

The pilot looked grimly across the cockpit to the observer, "Going to have to use the hook." The man in the right seat nodded. There was no other choice. Speed and weight, 20 or more tons of metal and fuel, made the A3D a ponderous ground vehicle and if the field emergency arresting gear didn't work the aircraft would end up in the mud. Damage or injury to personnel was difficult to predict but it could be costly.

Fortunately, the emergency arresting gear functioned properly in its sequence — the tail hook caught a cable stretched across the runway and with the cable attached to a thousand-foot length of chain on each side of the runway, the A3D was brought to safe stop on the runway. Credit another save to this device which gets its stopping power, appropriately enough, from anchor chain.

By way of contrast, note how this FJ-4B pilot reacted to the problem of stopping on the runway. He made a precautionary flameout approach and touched down with excessive speed one-third of the way down the runway. Maximum braking was tried, but seeing that the aircraft would not stop in time he locked the brakes, blowing the tires and grinding the wheels down to smoking half-moons of metal. The jet stopped 1300 feet from the end of the runway. It was quite natural for the official comment to say "The purpose of the field arresting gear is to prevent this type accident."

While these two situations provide fairly clear-cut reasons for using the emergency arresting gear (even though the FJ-4B pilot failed to do so), more and more pilots are responding to marginal situations of airspeed and runway with the tail hook. This is generally encouraged. For example, this is a squadron skipper's advice following an accident: "All squadron pilots have been advised to use the arresting gear if in doubt as to the ability to stop the aircraft. Embarrassment is preferred to danger . . ." *

Another CO put it into different words but the thought remains basically the same. " . . . pilots of this command have been thoroughly briefed to ultilize the arresting gear as a precautionary measure whenever a marginal safety factor is involved."

Though this attitude may seem conservative or overcautious it has, from all indications, paid off. The exact number of "saves" made by field arresting gear can never be known; it can be argued that a good percentage of the aircraft making successful arrestments would probably have stopped on the runway without the use of the tailhook. Nevertheless, the chart on page 8 makes interesting reading. It represents a typical day by day log of aircraft which used the arresting gear during just one

* *A forthcoming revision of OpNav Instr. 3750.6C will no longer require the inclusion of the pilot's name or serial number or certain routine incident reports (i.e., forced landings, field arrested landings, lightning strikes, etc.).*

month this year. The implication of this chart is "When in doubt, use the arresting gear."

In order to eliminate any possible misunderstanding about the tailhook-cable combination, one aspect deserves emphasis. The system was not designed nor developed for indiscriminate use as a "crutch," and in no way replaces the normal stopping procedure. When distance required for stopping using wheel brakes, aerodynamic braking, drag chute, etc., does not appear to match the runway remaining then the emergency arresting gear serves as an assist to stop the aircraft from rolling off the runway onto unprepared surfaces.

As there are three distinct types of equipment which may be loosely called "arresting gear," some definitions are in order. The equipment mentioned so far has referred to "Emergency chain-type arresting gear" which is suited only for tailhook equipped airplanes. Mobile Arresting Gear (MOREST) also requires a tailhook, but as the name suggests, the equipment and techniques are very close to those used aboard carriers. At present MOREST is used at certain fields operating Marine Corps Squadrons. It is used extensively for FCLP as well as emergency aresting gear. An Air Force version of "the quick stop" is the runway overrun barrier (type MA-1A). Prime advantage of the barrier type equipment is its ability to arrest hookless jet aircraft.

The first Bureau of Aeronautics publication dealing with the emergency chain-type arresting gear was dated October 1952. The original bulletin has gone through half a dozen revisions since then. A simple illustration pointing up the growth that has taken place is the increased weight of the anchor chain used to bring today's jets to a stop. In 1952 the majority of the installations provided 12-15 pounds per foot. Bulletin Number 7 appearing in mid-1958 advised airfields operating the A3D to use a chain weight averaging 60 pounds per foot.

Even the emergency arresting gear could not escape some specialization. At present two typical installations are in use. One location is at or near the end of the runway. This is preferred as it makes possible a maximum availability of the gear in case of aborted takeoffs or sudden landing emergencies. Through usage the cross deck pendant and chain at this "end of runway" location has come to be known as "abort gear."

Continued

Continued from preceding page

Since actual placement is dependent on such factors as runway length, condition of overruns, and type of traffic, the term "end of runway" is not always accurate. For example, NAS Cecil has what is called "primary abort gear" 2000 feet from the upwind end of the duty runway. At the end of the runway, a few feet into the overrun area, there is "secondary abort gear." Only the secondary abort gear is left permanently rigged at the various runways.

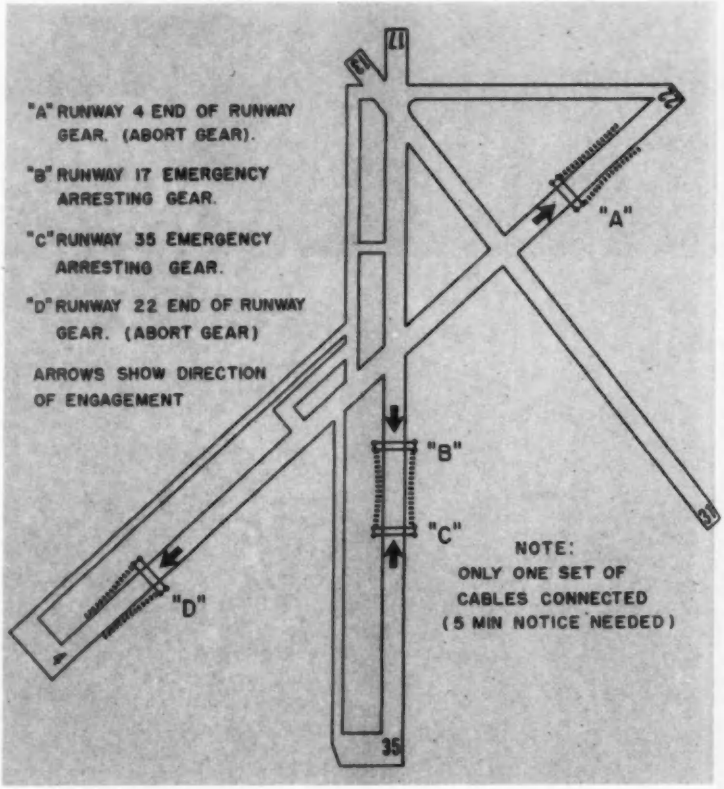
If the pendant and chain cannot be installed near the end of the runway a two-directional installation located at or near midfield is used. It is this gear which is specifically labeled "emergency arresting gear." The two-directional feature permits landings to be made in either direction by connecting the cables at the appropriate end of the chain. For landings in the opposite direction, resulting from a wind shift or special request, the cable rigging is reversed.

Mid-field or "emergency arresting gear" is normally used for prior known emergencies—emergencies which afford time to put the cross-deck pendant in battery position. Examples of these situations are known landing gear malfunctions, unsafe landing gear, known blown tires, and all cases where the brake system is known to be out. All of these examples have one thing in common: *The possibility that the pilot will lose directional control.* Should a swerve develop after braking effectiveness is lost the plane is likely to leave the runway.

A technique has thus been developed in conjunction with the emergency arresting gear which brings another term into the airman's vocabulary—short field arrestment. You may also hear "short runway" emergency arresting gear which refers to the same thing. It is similar to a carrier landing. Where a pilot using the abort gear will have rolled a considerable distance along the runway a short field arrestment puts the touchdown point close to the cross-deck pendant. It is a hook-down approach with the desired touchdown close enough to give controllability up to the time of hook engagement yet distant enough to prevent an accidental in-flight engagement.

The abort gear on the upwind end is not considered desirable for a short field arrestment due to the limited amount of runway available if a waveoff is required or the engagement fails. Formerly if a field had no mid-field position it had no adequate "short runway" capability. Now the trend is to modify the abort gear on the end of one runway into what amounts to two-directional equipment, to provide for short field arrestments.

Naval air facilities in the San Francisco Bay area reflect the importance attached to this service. Both NAS Moffett and NAS Alameda have short runway emergency arresting gears. At Moffett, for example, the cross deck pendant is 2000 feet from the approach end of runway 32R. Why the interest in such gear? The answers must be in general terms of course, keeping in mind that preventing a swerve off the runway is one objective. A long

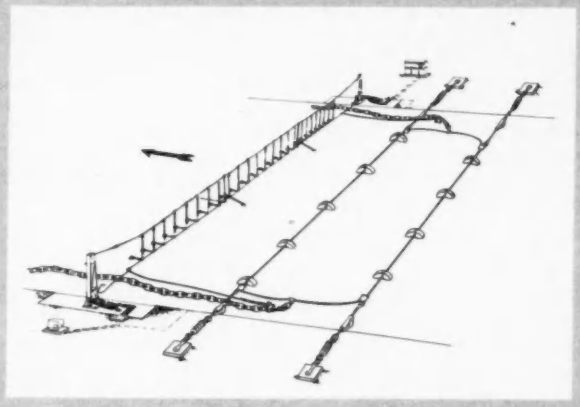


In this sample airfield layout two basic locations for field arresting gear are shown. Depending on the duty runway, only the appropriate location ("A" or "D") on runway 4-22 would be rigged for an arrestment.

rollout with, for instance, a swerve due to collapsing gear, gives a prolonged period when sparks may be generated with exposure to fire. This spark producing period is shortened by an arrested landing. Also, with a rollout the final stopping point on the field is impossible to predict. Arresting gear localizes this and permits a surer placement of crash equipment.

Unfortunately failures do occur with the chain type equipment. In most cases these failures involve the cross-deck pendant and are caused by high-speed, off-center engagements. The April issue of APPROACH, page 14, contains information relative to emergency arresting gear operations. Although successful arrestments have been made up to 170 knots, the maximum recommended speed is 150 knots.

A recurring theme appearing in reports of landing rollouts and aborted takeoffs which end in the overrun concern misjudgment of speed. "I decided to



Rigged and ready for action is this combined MA-1A Overrun Barrier and Pendant Type Arresting Gear. At right is a closeup of "fiddle bridge" holding cable off runway in "battery position."

With the starboard main landing gear hanging loose the pilot planned for a short field arrestment. Touchdown was just in front of the cross-deck pendant.

Continued from preceding page

drop the tail hook but just then I crossed the arresting gear" is a representative statement. Unfortunately, there are few ground rules which can be used for recognizing excess speed, and all too frequently only scant seconds are available for decision making. In some basic situations the uncertainty on whether or not to drop the hook is being eliminated by written or briefed instructions. This also applies to the question of shutting down the engine to eliminate residual thrust.

The approved squadron procedure may have resulted from an unsatisfactory pilot technique in the past. For example, following an F4D-1 accident, the board said " . . . an error in technique in that the pilot did not shut down the engine when he made his decision to abort the takeoff."

Another accident board refined the engine shutdown procedure slightly. "It was noted that the pilot did not shut off his engine during the abort procedure which is felt would have been advisable. It has since been made squadron policy to shut down the engine on all aborted takeoffs when the airspeed has accelerated above 70 knots, in addition to dropping the hook."

The benefits of securing the engine can be seen by this example coming from a Gulf Coast air station. When a pilot landed downwind in the rain, a thunderstorm was moving over the field bringing rapid wind shifts, the aircraft went off the runway into the overrun. A few weeks later, the same pilot under almost identical circumstances was able to stop the aircraft 1000 feet short of the overrun by flaming out the engine after touchdown.

Here is a situation where both tail hook and engine shutdown were used. After takeoff an A4D cockpit filled with smoke and the pilot set up for an immediate landing on a runway which had abort gear. Due to high gross weight the approach and touchdown speed was higher than normal. Following touchdown the engine was shut down and hook dropped. An uneventful arrestment resulted.

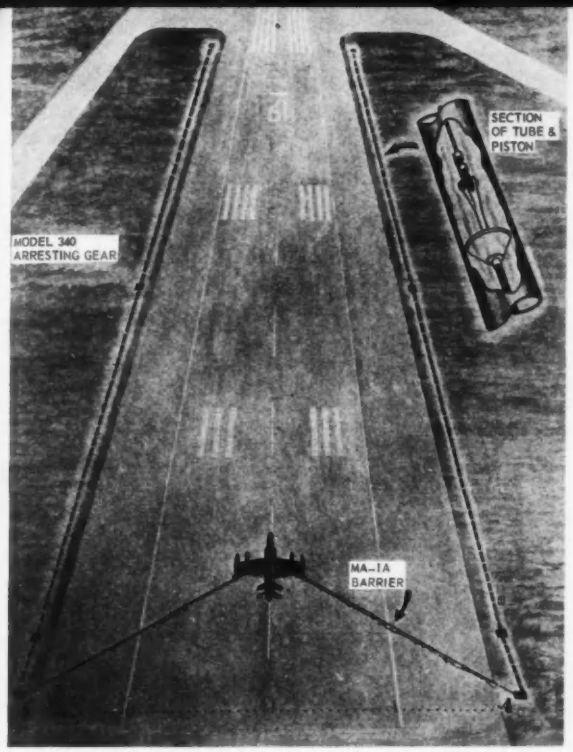
While the mission of the field arresting gear in saving aircraft and preventing major damage has proven so successful that field arrestments are likely to increase, there is a sobering thought in the following comment concerning an arrestment: "This occurrence (on a wet runway in IFR weather) at first glance appears to have resulted in an aircraft saved. In fact it did. However, the resulting delay in reopening the runway necessitated by rerigging the chain may have cost another plane . . . it is suspected that delay . . . may have caused another aircraft to terminate its penetration to the field and later run out of fuel due to difficulties in connection with an attempted letdown at an adjacent field.

"This possibility is mentioned to point out the undesirable situation that exists in connection with the chain type emergency arresting gear in common use on Navy airfields. The rerigging time is unacceptably long in most cases . . . "

Whether or not the suspicion turned out to be true, the vision

Following a decision to abort . . . "the brakes worked good and I was slowing satisfactorily" said the pilot. "As we approached the aborting gear the copilot asked if I wanted the tailhook. I said 'no' because I thought I had it made."

Aborting the takeoff a pilot dropped his hook immediately. The brakes faded from heavy use and the pilot said he would have been across the overrun into Lake Washington except for the arresting gear.



At left is the new "water squeezer" emergency arresting gear. Drawing shows Air Force version used with Overrun Barrier. Navy model substitutes cross-deck pendant. The designed quick rerigging time for the water squeezer is in great contrast to the usual time needed to straighten out the chain type arresting gear (above). Enroute supplement (below) distinguishes only whether runway has Overrun Barrier (J-bar) or arresting gear (A-gear).

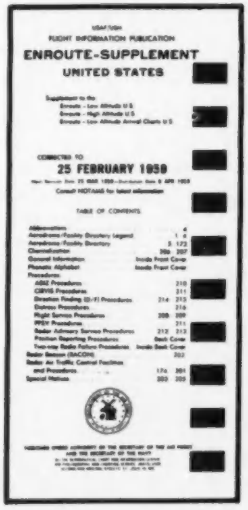
of a fouled runway with low state jets circling overhead is enough to cause crossed fingers at Operations whenever a pilot drops the hook. Rerigging is cumbersome and does take time, from 15 minutes to as long as an hour if things go wrong. After an arrestment the cable must be cleared, the chain dragged back into position by a tractor or truck and the cross deck pendants put into position and retensioned.

"It is felt," said a squadron CO, "that the time has come for a more sophisticated type of abort gear system to be developed. Regardless of the effectiveness of the present techniques, the system itself is archaic in that it requires much rigging and un-rigging time."

There is good news for those who hold such views. A recent Bureau of Aeronautics endorsement notes that as funds become available the chain type emergency gear will be replaced by more adequate "water squeezer" arresting equipment. The first such installation is operating at NAS Dallas.

The "water squeezer" is actually simplified flight deck arresting gear. A tapered tube is located on each side of the runway, buried to eliminate obstructions. The tubes are filled with an antifreeze solution to meet the all-weather problem. Inside the tube is a conical piston, connected to a cable which is reeved through a deck edge sheave and then connected to the cross-deck pendant.

When the pendant is engaged the runout pulls the pistons through the fluid, thus absorbing energy. As the constant diameter pistons are pulled down the tapered tubes, the narrowing orifice absorbs energy at almost a constant decelerating load until the aircraft is brought to a safe stop. The tubes are 920 feet long and the runout of aircraft using the gear at Dallas has varied from 750 to 900 feet.


FLIGHT INFORMATION PUBLICATION

ENROUTE-SUPPLEMENT

UNITED STATES

CONNECTING TO

25 FEBRUARY 1959

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The real feature of the water squeezer is its retrieving mechanism. At the rear of the piston a line is attached which, as the piston is pulled down the tube during an arrestment, feeds from a coil. To reset the pistons the

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FIELD ARRESTING GEAR INCIDENTS*

DAY OF MONTH	MODEL AIRCRAFT	LOCATION	DETAILS
1	F3H	Alameda	Utility system failure. Tail wind component.
2	F9F-8P	Cecil	Wet runway and heavy fuel load. No wind.
5	F8U	Leeward Pt.	Wing down landing at 165 knots. LSO assisted.
6	F9F-6	Dallas	Blown tire on takeoff. Use of "water squeezer." Engage at 110 knots with 800-foot runout.
6	F8U	Cecil	Utility hydraulic failure. Engage at 80 knots with 1000-foot runout.
6	A3D	Whidbey	Wet runway and drag chute fouled. Hytrol partially effective. Engage at 80 knots.
6	F11F	Miramar	Wet runway, light winds. Braking action poor. Engagement at 70 knots, 200-foot runout.
6	F8U	Cecil	Wing down landing. Engaged mid-field at 150 knots. 100-foot runout before pendant broke. Stopped before engaging abort gear.
8	F8U	Cecil	GCA to wet runway with tail wind. Engaged secondary abort gear.
10	F8U	El Toro	Precautionary engagement due to utility system failure.
11	FJ-3M	Dallas	Loss of hydraulic pressure. Engage "water squeezer" at 115 knots with 750-foot runout.
11	F9F-8	Olathe	High gross weight on precautionary landing. Engage at 85 knots.
12	F4D	Moffett	High gross weight and threat of engine seizure. Shutdown on touchdown. 200-foot runout.
13	F2H-4	Quonset	Unsafe nose gear indication. Precautionary engagement.
14	A4D	Fallon	Loss of utility system. No flap landing with brake made before arrestment.
14	F4D	Oceana	Flameout on final. High touchdown speed with hook engaging midfield pendant.
15	AD-5	Seattle	Loss of hydraulic pressure. No flap landing with little braking action. Engage at 10-20 knots.
15	F8U	El Toro	Utility system failure, light winds.
16	F9F-8T	Olathe	Suspected unsafe nose gear. Following arrested landing strut collapsed. Nose rested on speedbrakes.
17	A4D	Fallon	Aborted takeoff at 130 knots. Shutdown and dropped hook. Stopped prior to engagement.
20	F3H	El Centro	Utility hydraulic system failure.
22	F3H	Miramar	Utility system failure.
23	F3H	Miramar	Utility system failure with indication of flight control system failure. Engage at 80 knots.
23	F8U	El Toro	Utility system failure.
26	A4D	El Toro	Arrestment following a precautionary flame out approach.
26	F8U	Beaufort	Utility hydraulic failure. Arrestment into MOREST gear with boosted brakes unavailable.
27	F8U	El Toro	Precautionary arrestment due to utility system failure.
27	F8U	El Toro	Utility system failure. Engagement at 100 knots.
27	F9F-8P	Cecil	Port main gear indicated unsafe.
29	F4D	El Toro	High gross weight and speed. Engagement to prevent overrun.
29	F8U	Alameda	Utility hydraulic pressure lost.
29	F11F	Oceana	Combined system hydraulic failure. No-flap, no-slat landing. Engaged midfield gear.
29	FJ-3M	Dallas	Aborted after takeoff. Dropped hook and engaged "water squeezer" at 120 knots. 900-foot runout.
29	F8U	Dallas	Fast approach, both tires blown. Arrestment without further incident.

* Based on FLIGA reports (para. 7.g. of OpNavInst. 3750.6c)

retrieving line is attached to a vehicle and the piston pulled back to the rigged or "battery" position in a matter of five minutes or less. For even faster recovery an engine or motor driven winch can be used.

But even as engineers strain to modify and improve, seeking more efficient equipment, it seems there will always be one more "eventuality" to provide for —as witness this recent incident. It concerns a two plane section of FJ-4Bs making a GCA approach.

Weather at the time was decidedly wet with water standing on the runway; the ceiling was a ragged 1000 feet with moderate to heavy rain reducing visibility. Wind was down the duty runway but was only 2 to 3 knots.

Fuel state was 3000 pounds for both planes. The leader touched down at 130 knots about 1000 feet from the threshold. His wingman had taken a short interval and touched down several seconds later on the opposite side of the runway, 600 to 1000 feet behind. From here the official report is quoted.

"Aerodynamic braking was used to slow the aircraft to 90 knots at which time the nose gear was lowered to the runway, flaps retracted and the brakes applied. Very little braking action was available because of the water standing on the runway. The leader dropped the arresting hook and informed his wingman he was going to engage the arresting gear. The wingman replied that he might have to engage the arresting gear too. The leader then retracted the hook, secured the engine and attempted to engage the jet barrier at the end of the runway . . . "

When the leader cleared the cross deck pendant the wingman dropped his hook and made a successful engagement at approx-

imately 45 knots. Meanwhile the unfortunate leader failed to catch the barrier cable and splashed off the end of the hard surface into the overrun for a hundred yards. Except for a muddy tow journey back to the runway, there was no damage.

For the pilot who may one day have to depend on the stopping power of anchor chain there is first of all the question of knowing, either by a briefing or through personal preflight planning, the location and type of equipment at the point of departure (for aborted takeoff or immediate landing after takeoff), and at the destination. The Enroute-Supplement for the United States and Terminal Flight Information Publication (letdown plates) both contain abbreviated but useful information. On individual letdown plates such details will be found on the airfield drawing. As all stations should report the status of the field arresting gear if not available for use, check the NOTAMS also.

There is, however, a limit to the scope of review for, as one experienced aviator observed, "nothing can replace timely and accurate information from the control tower." Corroborating this is an F3H pilot's statement following an emergency arrestment. "I informed the tower that I would land on 5L," he said, "but the tower said to set up the approach to 5R because the overrun abort gear was rigged on that runway."

In summary there is probably no better advice than that given by a fighter squadron operating high performance jets: "Pilots are encouraged to use the arresting gear whenever there is doubt about being able to stop with brakes." To this the pilot should list for himself, the conditions which may result in the need for the tailhook and be alert should he meet them singly or in combination.

HOOK POINTS—*excerpts from accidents and incidents dealing with emergency arrestments.*

The lighting of runway distance markers and the field arresting gear is considered highly desirable. It was pointed out that, particularly with some of the new aircraft . . . braking is difficult on wet runways and a decision to use the arresting gear must be made promptly. The problem is increased during night operations where there is no indication available to the pilot as to where the abort gear is located (examples to date include amber plexiglass covers placed over the four runway lights on each side of the runway preceding the abort gear and at another field by an array of six flare pots on a raised frame).

. . . Damage to this aircraft could have been avoided or greatly minimized had the aircraft engaged the barrier straight ahead or perpendicular to it. This is one of the chief factors in this accident . . .

When there is a question as to whether an aircraft can be stopped by using maximum braking, the prime concern of the pilot should be the maintenance of directional control so that he may engage the arresting gear straight ahead and in the center if possible. Once a tire is blown, directional control becomes more of a problem and the probability of a successful arrestment is diminished.

Arrangements have been made with the control tower for A4D aircraft to make all final landings on runway equipped with abort gear whenever feasible. Squadron pilots have been briefed to request such runways for all final landings and to have their speed reduced and under control prior to reaching the abort gear if a normal rollout is intended.

Assuming a complete utility system failure the F3H pilot returned to base immediately. Preoccupation resulted in his forgetting to dump wing fuel and thus the relatively heavy landing weight coupled with calm wind conditions caused the use of more than normal braking action. This resulted in overheating of the port brake assembly which subsequently resulted in the explosion of the port tire after return to the line.

To prevent the recurrence of situations of this nature, it was impressed upon all pilots that in any case where a known or suspected malfunction of this nature occurs, serious consideration should be given to using the abort gear as an aid in stopping the aircraft. The use of the arresting gear in this instance would have prevented the necessity for utilizing considerable braking action and overheating the brake assembly.

The maximum recommended engaging speed for chain type arresting gear is 150 knots though in a few isolated cases, successful arrestment have been accomplished at speeds up to 170 knots.

It was night with wet runways and no wind. The F8U pilot was fast as he approached the chain type abort gear 2000 feet from the end of the runway, but felt he could stop by using brakes. After he passed over this gear he realized that he could not stop the aircraft . . .

The high incidence of use of emergency arresting gear on wet runways is well known. Pilots should remember that landing on a wet runway calls for special care to have the approach speed and touchdown point at the optimums and that, even then, use of arresting gear may be necessary and should be planned. ●

'TAG— YOU'RE IT!'

JUST what constitutes a flight violation?

Ever hear the old poser about a tree that falls in a forest where there is no human or animal life to hear—then you're asked, "Was there any sound?"

You probably concluded that sure, there had to be sound, for sound is the creation of a wave, and there's no rule that says the sound has to be heard, is there?

And so it is with flight violations. There's no rule that says it must be detected and reported before you call it a violation.

For example, you're cruising along at many thousand feet and you've had several cups of that delicious Navy coffee so you head back aft. The copilot is real sharp, no need to worry about him—just remind him of the posrep due in 4 minutes, and back you go.

Bang! You're guilty of a flight violation! Sure you've done it many times before, sure you'll be back in a few minutes, but that's no excuse, *you are guilty of a flight violation*, and you can argue till you're out of gas about how illogical is the rule that you've violated, you're still on the chopping block.

What's even worse, you've put your passengers on the block along with you, for you've broken the rule that says " . . . the pilot in command will be responsible for both seats being occupied at all times." (See CNO 202206Z of March 1959.)

So, like the tree in the forest, your violation occurs, but no one gets hurt, no one particularly notices. You amble back to your seat after a brief chat with the pretty nurse, and the whole thing becomes past history. Except the nurse—gotta drop around to sick bay tomorrow and get some APCs. Or some cough medicine, or anything.

Now, how does a seemingly harmless flight violation like this become meaningful? Well, let's consider *why* CNO put out the rule (that's right, RULE—not pilot's option) about two folks in the cockpit all the time. Couldn't be because he doesn't trust you, or your copilot—after all, you've got enough hours to make 5 digits. Could it be the rule was intended to prevent or lessen a known hazardous situation? Yes, it sure could.

Maybe some folks can make like a one-man band, but usually the music is only passable. And the same is pretty much true up on the "bridge" of an R6D or *Connie*—or even an R4Y or P2V. One warm body can only handle so much, and keeping a sharp continuous lookout in all sectors is just more than he was designed for; it's more than the airplane cockpit was designed for too.

So your trusty copilot takes a quick look around, as best he can from the right seat, and starts to put together a position report —with a glance at the gages now and then too.

Yikes!

Where did HE come from? Blind spot on the port side? Big one too—a *Super-G Connie*.

Sure he was VFR too, but your copilot's turn over the station took you right into the *Connie's* path. And that miss was close enough for him to see your empty seat.

And suddenly it's no longer a flight violation, it's a Flight Violation, filed by an airline pilot who had you in sight all the time, including your turn into him. This time the falling tree was heard. The airline passengers, including the senator, aren't going to be kindly disposed toward you, are they? But they don't know *you* yet, they only know "big white airplane with UNITED STATES NAVY on the side." So the Navy takes the big licking. Oh you'll get yours later no doubt, but no disciplinary action imposed upon you will wipe out the impression in the minds of those passengers — far as they're concerned, the U.S. Navy endangered them one day and therefore the U.S. Navy is a danger to people riding airlines. Even if you were strung up from a yardarm they wouldn't know it; couldn't care less.

A flight violation either *is* a violation or it isn't. You're the immediate judge, on the spot, but you're not the ultimate judge. Violating a published regulation in an emergency situation, when the safety of your aircraft is enhanced by your act, will usually

Aviation safety officers and the Naval Aviation Safety Center stay as far away as possible from any participation in disciplinary aspects of aircraft accidents, incidents and flight violations. This is in accordance with the Navy's objective philosophy.

In discussing flight violations, APPROACH is *not* concerning itself with whether you are caught or punished for flight violations. APPROACH is concerned with the fact that anything you do or don't do which exposes you to a flight violation is also a breach of standing operating procedures, and consequently a threat to safety!

not be considered a violation—*but don't accept this as a hard and fast rule.* Each case is treated separately in the light of its own circumstances.

One important thing about flight violations is that you often *don't know* the degree of danger you have created by violating. Like using the Guard channels for non-emergency traffic, for example. You get on Guard to ask for this or that, and when you're done you're satisfied that your little "violation" (yes, it's a violation!) hasn't really hurt anyone . . .

Meanwhile, the youngster who needed Guard to announce his emergency to the world found the channel cluttered — someone asking for a truck to meet him on the ramp . . . under less hectic circumstances he'd try another channel, or wait if he could, but his big bird is gliding like a mallard after stopping a load of buckshot, so out he goes . . . the water was warm enough, he had a raft, he *should* have survived . . . but we'll never know. The truck met your aircraft on the ramp though.

Why all this concern about flight violations, you ask? They don't cause *all* the accidents or fatalities; many of them don't cause anything except a good scare—or even nothing at all, like the tree falling in an empty forest . . .

True, very true, but here's why we're harping on this subject: only YOU can cause a flight violation; only YOU can stop violating.

CNO can't prevent flight violations. He can order you not to commit them (he has done so), and he can discipline you after a violation—if you're alive to be disciplined, but he can't sit on your shoulder and push the stick this way when you try to push it that way.

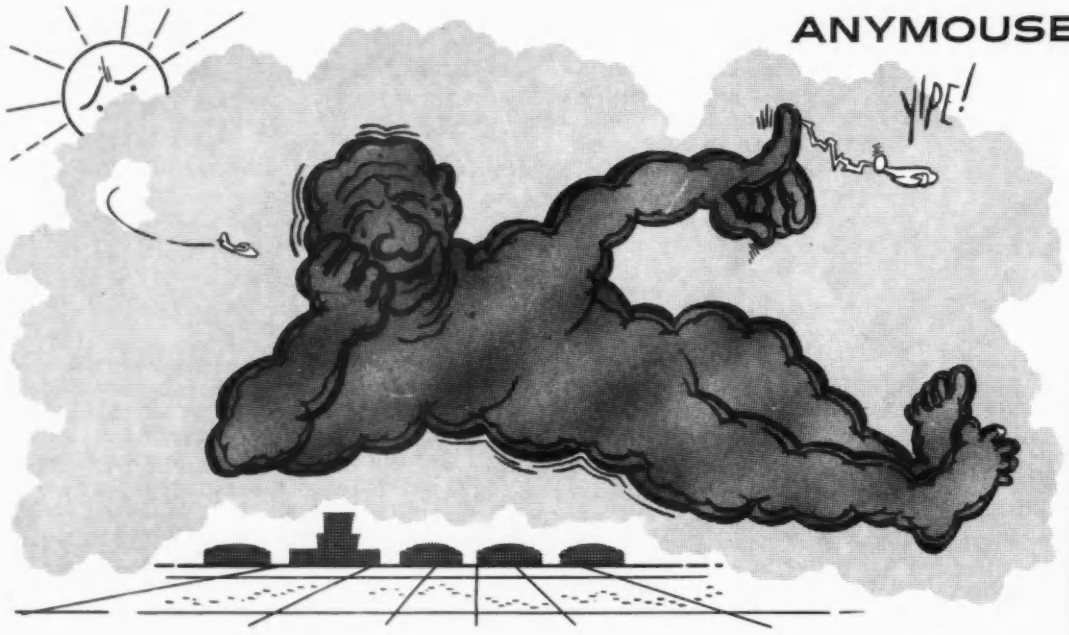
If you feel, and maybe have occasionally expressed out loud, that *"they* oughta do something about that . . . *they* oughta make it safer . . . "then YOU sir, are one of the *they.* YOU can take positive action *right now* to see that no flight violation which might occur tomorrow can possibly be attributed to you. It's been done before in other areas—like the Perfect Landing Month that October 1958 was for ComNavAirPac. Every aviator said to himself, "by gosh, they may not get away with no landing accidents, but I'M not going to be the one . . . " and no one had a landing accident.

See how easy it is? Now suppose we said, "let's make June 1959 NO Flight Violations Month, Navy-wide — everyone who commits a FV is a big so-and-so" don't you think we'd have lots fewer violations? YOU wouldn't want to be the ONE so-and-so in your squadron or Air Group, would you?

The primary thing you should remember about violations is this: *The fact that you get away with a violation does not remove nor lessen the danger that you created!*

A flight violation is a *failure.* Just like a failure of a bolt to hold because it was over-stressed, your violation is YOUR failure to heed and adhere to published rules. Big difference here is that the bolt is immune to discipline —once it fails it's gone and will never harm anyone again.

But *you* can continue to roll downhill like a snowball, gathering more innocent victims with each revolution. You could go on for an entire career, and not be a victim of your own violation until the very last one . . . it might be a very "harmless" one —like ducking through a cloud . . . the guy coming the other way probably thought so too . . .



BLIND DATE

IT WAS the thunderstorm to end all thunderstorms. GCI measured the tops at fifty-one thousand feet and the base was amply supported by the tower, three hangars and miscellaneous buildings at the air station. We radarmice were in our GCA trailer chatting amiably with a few men who were fooling around wondering why they hadn't become shoe salesmen or something equally dangerous. One of them was driving a P2V in a holding pattern at 3000 feet and the other was doing likewise at 4000 feet in a C-121. We explained that although we knew they were having a rough time of it, there wasn't too much we could do to help them at the time. Extremely heavy rain had cluttered our scopes to the point where they looked as though someone had gotten to them with a yellow paintbrush.

Enter Anymouse in a *Beech*, more or less at 5000 feet and thoroughly confused. "What ho!" he cried through the spray. "Stinko" replied approach control, and things were off and running.

All the SNB nav aids were out with the exception of the omni receiver. Fuel remaining amounted to 40 minutes. Finally Beechmouse reported he thought he was over the omni and he was given a heading to take him to an area where the precipitation was thin enough to make radar contact. Mouse did not tell us he was having a hard time maintaining a heading due to the turbulence so when a target appeared in the approximate vicinity of where he should have been, all turns and headings were so far off, that we didn't believe the target was our *Beech* at all. Fuel state was now 20 minutes.

At this point lightning struck, but literally. A power failure knocked out the tower, approach control, communications between tower and GCA trailer, and all contact with ARTC. Fortunately the GCA unit had been operating on auxiliary power and was not affected. Approach control frequencies were set up in GCA and one operator became, out of necessity, approach control.

[1] The purpose of Anymouse Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— SUBMIT AN INCIDENT, PREVENT AN ACCIDENT —

The *Beech* pilot declared he was rapidly losing control of the situation and would have to descend immediately. With the two other planes cleared out of the holding pattern the *Beech* assumed a nose-down attitude with the throttles chopped. However, it was in the grip of the storm and began a merry *climb* at a 1000 foot per minute. Eventually this elevator ride ended and the SNB started back to the omni. Fuel for 10 minutes now.

When the flight arrived over the omni this time radar showed a slackening in the storm out toward the west. Luckily the pilot hit this area just right and soon called that he was VFR with the field in sight. He was promptly told to land on it.

It was in operations later that we learned that the pilot had not flown instruments in an unbelievably long time, as was evident from his inability to maintain headings. Three of his four passengers were sick from the bouncing around but all this was overshadowed by what the gas crew found, or didn't find. There was hardly enough gas left to measure.

BLESSED EVENT?

THIS Anymouse was returning from a loft practice hop and was number 3 in a 6-plane flight of ADs. As I was turning base for landing the pilots behind me noticed a trail of white smoke coming from my aircraft. They neglected to inform me of this, although one said later that he would have if it looked as though I might take a waveoff.

Upon touchdown the tower informed me about the smoke and at this point the crash crews started chasing the plane. I looked back and there was a cloud of smoke that was almost thick enough to cause the field to go IFR. As this AD-7 had demonstrated a similar symptom several days before, a small malfunction of the scavange system, I assumed it was the same difficulty and told the tower I did not need assistance.

Then I saw a moderate amount of oil spreading along the wing. "Probably also broke a small line," I thought, and continued taxiing to the line. All the while I kept a close watch on the oil pressure gage which showed adequate oil pressure. Upon reaching the line I was greeted by frantic "cut engine" signals. I did so and upon dismounting from my trusty aircraft saw engine oil pouring out as though there was a hole in the sump, which in fact, there was! The sump plug was missing.

I found out that the night before the plane had been in check. The check had been started before evening chow, interrupted by the meal, and completed thereafter. The mech who pulled the check on the front sump remembered that he had been working on the magnetic sump plug and he thought that he had secured it but could not remember using safety wire. As soon as the check was done the crew leader was to go on leave (his wife was having a baby) so he signed the check sheets.

The inspectors were busy with

Continued from preceding page

troubles on other aircraft and, in the interest of increasing availability as the squadron was on a 2-week gunnery deployment, the aircraft was permitted to leave the hangar without proper post-check treatment. Anymouse, me that is, a designated squadron test pilot had preflighted in the dark (watch this next item) without a flashlight for a dawn launch so the condition of the sump was not seen.

BRAILLE

I WAS taking off for a paddles FCLP period in an A4D-2 and upon becoming airborne I lifted my gear normally. Immediately I throttled back so as to stay below 150 knots and commenced my turn downwind for the first pass.

Upon reaching the 180-degree position I gave my report to "paddles" and distinctly said "gear down and locked." When I turned in to the groove the LSO gave me a waveoff and much to my dismay found my gear up and locked.

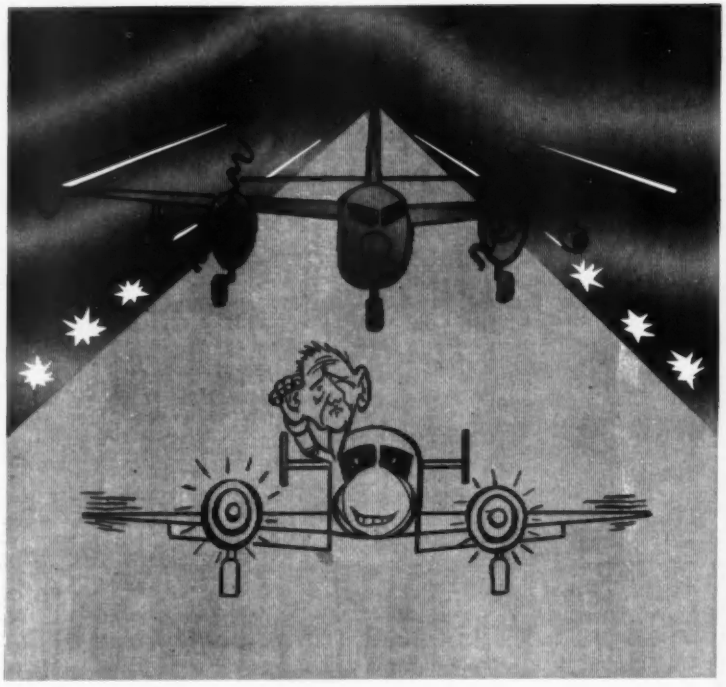
This is an old story and what I recommend has been repeated many times but I'll say it again—reach out and touch that gear handle and look at those indicators, then give your 180 call.

WHISTLE BLOWER

JUST in case the other gent in this account does not deem it wise to forward his story to you I shall be glad to blow the whistle on him.

Being a desk jockey I took care to pick a beautiful, moonlit, star filled night to bring ye old log book up to date. I filed IFR in a Beechcraft for an air station about 2½ hours away, picked up a load of four passengers, and got underway.

We reached our destination and turned on final. A P2V-7 was in the warm-up area. Being cleared



to land I did so as uneventfully as can be done in the "bouncing *Beech*" and when it was under control we switched from tower to ground control. The aircraft was rolling on the duty runway and ground control told us to go to the end of the runway and turn off "amongst those blue lights."

This was fine except that while approaching the turnoff we were suddenly "awakened" (terror-stricken?) by the sound of what appeared to be two jet and two recip engines in the near vicinity. To confirm our suspicions we looked out and up to behold one large P2V blocking out a large portion of the beautiful, moonlit, star filled sky as he went over us.

Investigation revealed that this lad had been cleared to taxi into position and HOLD. Even if we had stayed on tower freq we wouldn't have heard it as we were on VHF with the P2V on UHF.

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BOOSTER

ON a sunny Cuban afternoon this Anymouse departed NAS Leeward Point in an A4D and headed out for some sport in the form of a LABS fam and area check. After flying around the area for awhile I started doing a few LABS maneuvers at 10,000 feet. Then I dropped to 5000 feet and tried another. Finally I got down to 1000 feet to simulate a run-in and delivery.

Going over the top I started down inverted then tried to roll out. To my surprise I had no aileron boost control: the power package for ailerons had disengaged somewhere in the maneuver. Inverted, with the nose about 40 degrees below the horizon, a whole lot of muscle assisted by trim enabled me to roll the aircraft upright at about 350 knots and 4000 feet.

A much frightened Anymouse took his bird back up to altitude, stick extended of course, and tested the controls by simulating a landing pattern. The aircraft had normal elevator and rudder power boost but the ailerons were strictly muscle boosted. I made a wide, easy approach to the duty runway and managed to get on and stopped without incident.

Naturally I recommend close inspection of power packages on all preflights and major checks but in cases where power boost is lost it is important to slow the aircraft as soon as possible. In this case the use of trim to help roll the aircraft is what I believe got me out of trouble.

DOORMAN

I WAS flying an SNB on a parts pickup flight with a passenger who was a storekeeper but who had previously been an aircrewman. He asked permission to go aft and while struggling with the intricacies of the relief tube he accidentally brushed against the door handle. I felt the plane lurch and as I looked over my shoulder I saw my passenger pulling the upper half of his body back into the plane.

In the future, no matter how well "checked out" my passengers appear to be, I intend to be more thorough in my preflight briefing. The *Beechcraft* door handle can be opened by either depressing or lifting the handle. To prevent the handle from being depressed into the open position a small "stop" has been installed as illustrated by the photograph.

WHO'S WHO & YOU!

If you have a book or file entitled "Who's Who In Naval Aviation," how 'bout making a pen and ink change under "A" and add the following facts:

A—Anymouse, (n), rate/rank, variable to suit the occasion; laundry number unknown.

Contrary to popular opinion, Anymouse does NOT reside at the Naval Aviation Safety Center—Anymouse is YOU! Anytime you have an experience or a safety idea which you feel is worth writing about, YOU are Anymouse if you relate your experience on an Anymouse Report Form—or even if you do it in an ordinary anonymous letter.

While the full title of the section in APPROACH is "Anymouse And His Hairy Tales," let it be understood that the tales need not necessarily be hairy, and they certainly are not limited to pilots or aircrewmen only. Anymouse is any person who reports something that he has done, seen, or experienced, that he's man (mouse) enough to admit in writing so that others in aviation may benefit, but that he may wish to keep anonymous for obvious reasons.

While NASC is interested in hearing of unsafe practices, the system is not a tattle-tale vehicle for reporting conditions within a command which should properly be reported through command channels.

New Anymouse forms are at your squadron now—let's have that one you've been intending to send in!

headmouse

Have a problem, or a question?
Send it to HEADMOUSE—he'll do his best to help.

Don't Borrow O_2 Masks

Dear Headmouse:

It seems to me that the Navy supply system is really falling down on the job when it comes to aviation equipment. I reported to the squadron about 8 months ago; went to check out some of the new flight gear (mini regulator, torso harness, etc.) and in about 2 weeks I managed to get all the gear required. However, I was lucky. There were several other pilots at the same time who were unable to get their gear and consequently had to borrow masks, etc. to fly. This just doesn't look right to me.

Many months have passed as well as many hours, and no accidents attributed to oxygen problems; however we are still passing oxygen masks from pilot to pilot every day. This type of thing runs against my grain . . . I think the Navy should look around a little more and take steps to prevent this type of thing.

ANYMOUSE

► You were indeed lucky. And so is your squadron, in not having any oxygen-caused accidents. And this type of thing runs against my grain too; toothbrushes and oxygen masks shouldn't be borrowed.

The Navy has taken, and continues to take steps to prevent such situations, and is always open to suggestions as to how it can get needed supplies into the field faster. When you or I look at any one item, we can readily see how easy it would be to need it this morning, ask for it this noon, and have it by this evening, but face up to the fact that the Navy must order, inspect, ship, store, issue, and account for literally millions of items. Oxygen masks happen to be one of them. Yes, oxygen masks are certainly more important than carbon paper or waste baskets, but that doesn't mean there's no problem involved in getting one into your hands when you need it.

According to our information, the area in which you are located received nearly a hundred regulators some time ago. Keep in mind that the Navy supply system includes your squadron material officer—improper requisitioning can mess up the works right in your own shop!

Very resp'y
HEADMOUSE

WV-2 Landing Gear Check

Dear Headmouse:

Landing gear door was not fully open and landing gear jammed on door during retraction. The landing gear lowered properly after this incident. The flight, however, had to be aborted. The landing gear door was damaged and had to be changed.

Investigation reveals that there is considerable variance of opinion among Connie pilots as to what constitutes a proper check and assurance that the landing gear doors are locked open on preflight inspection. The handbook says only to check to see that the red warning mark is not visible. Some pilots pull down on the forward door link as an additional check. Some pilots prefer to push up on the forward door link.

It appears that a proper and complete inspection would be to (1) check the warning mark not visible, (2) check the door and (3) push down and push up on the forward door link.

Recommend you investigate the functioning of these doors and publicize a complete and proper preflight inspection of the system.

This incident has occurred more times than indicated by FLIGA reports, sometimes because no damage occurs and sometimes because it is "covered up."

ANYMOUSE

► The preflight check prescribed by Anymouse is correct with the exception of the check of the main landing gear door. Unless the door is excessively out of position, improper cocking of the door will not be apparent.

The proper check is as follows:

a. Check the red warning mark to insure that it is not visible.

b. Push down on the forward door link. This insures that the hook is cocked.

c. Push up on the forward door link. This will recock the hook if it is out of position.

Shaking or otherwise moving the door will not insure that the door will close in proper sequence.

Very resp'y,
HEADMOUSE

Inconel Lock Wire

Dear Headmouse:

Your article "Safetywire, SNAFU" (July 1958) did a big service. A study of this problem has resulted in BuAer throwing out all "lock" wire but inconel. [*(Ref. BuAer letter Aer-MA-413/28 dated 12 March 1959) quoted here—Ed.*]

The Chief of the Bureau of Aeronautics plans to use only the following materials for "lock

wiring" in order to reduce misapplications and the number of stock items:

a. Inconel for all general lock wiring purposes.

b. 5056 clad anodized aluminum wire for lock wiring purposes when the wire is in contact with magnesium.

Copper wire will be used for "shear" and "seal" wire purposes only.

In addition to the above, the term "safety wire" will be discontinued in favor of the term "lock wire" to distinguish between "seal" and "shear" wire and "lock wire" all of which may serve safety purposes.

The following comments relative to the planned change are solicited:

a. What other non-insulated wire must be stocked for industrial purposes?

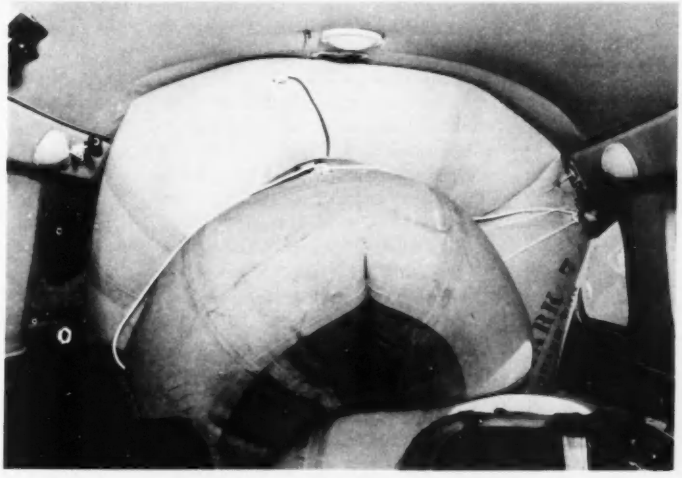
b. Is deletion of the 5056 aluminum alloy wire also recommended? The hazard of using this wire in a high strength, or high temperature application may be much greater than the benefits gained by its use in conjunction with magnesium in corrosive environments.

c. Of the wire sizes listed in MS 33540 what are the minimum number of sizes of Inconel and copper wire which will satisfy "lock" and "seal" wire requirements?

CDR R. T. BARBOR

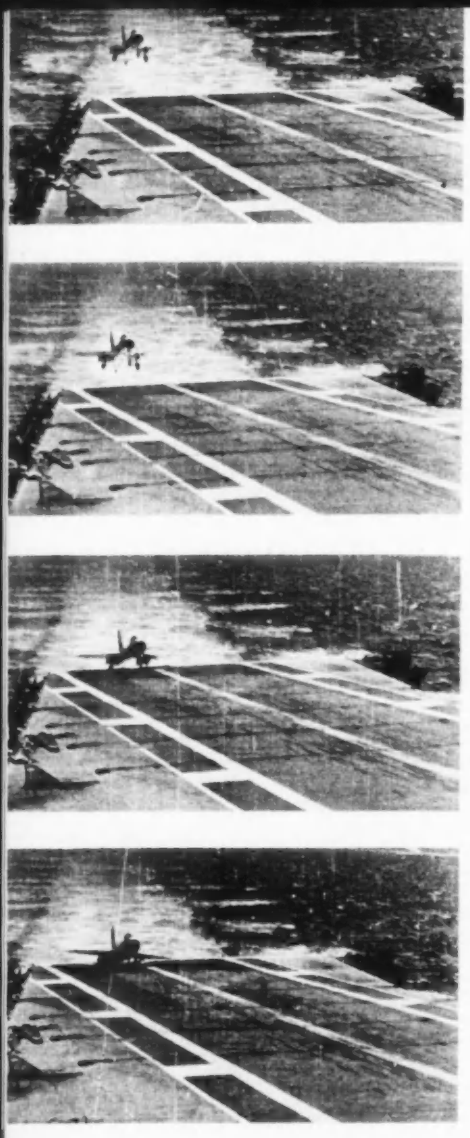
► Glad to see the correspondence and articles about safety/lock wire in APPROACH had some beneficial results. As I understand it now, "lock wire" will apply to items that must be positively *locked* against all uintentional loosening, like sump plugs, studs, clamps etc. "Shear wire" has some strength, to prevent loosening from vibration, but must be weak enough to break when force is applied—such as on emergency escape and life raft hatches, for example. And "seal wire" is an indicator only, has very little strength and is nothing more than a means of determining that an item has been used—such as used on the trigger of a fire extinguisher. Hope that several readers will provide Aer-MA-413 with comments as requested.

Very resp'y,
HEADMOUSE



YOU WRITE THE CAPTION!

What *did* the pilot say to the copilot when they looked back and saw THIS? We thought of about a dozen near-immortal phrases in less than a dozen minutes. And then we decided to share the opportunity with our readers; here's your chance to be quoted in APPROACH—and you needn't spend days writing a long story to do it either. (Of course, we'd be more than delighted if you are interested in writing a story for publication—let us know first, before burning much midnight JP-5). Just drop a note or postcard to the Editor with your proposed caption for this embarrassing situation. And if you have a suggestion for how to get out of the situation safely, please include that too. Soon as we receive enough captions, we'll publish them with credit to the writers.



A REVIEW OF SIGNIFICANT AIRCRAFT ACCIDENTS

TRUTH and CONSEQUENCES

FIXATION — Commencing his third carrier approach of a carqual period, the pilot of an FJ-4B was fast upon intersecting the glide slope. Power was eased off and the aircraft decelerated as it continued toward the ship, gradually going nose high and settling. After apprising the pilot of the situation and seeing no apparent response the LSO gave a waveoff on the mirror lights and over the radio.

The approach continued with the aircraft settling toward the ramp in an extremely nose-high condition. Speed brakes remained full out. No sound indicating an addition of power was noted at the LSO platform though the pilot stated he answered the waveoff immediately with full power and nose rotation to stop the sink rate. "As I moved my throttle forward" said the pilot, "I made a motion with my thumb to close my speed brakes but . . . I believe my thumb slipped right across the top of the actuating switch. The rest is history."

Striking the round-down below deck level, the port main gear sheared while the tail hook struck the weld that joins the round-down portion of the flight deck with the steel horizontal portion. However, the hook point did not break and number one wire was engaged. The FJ-4B went through 200 feet of deck run, dragging the port wing the last 150 feet.

"I was concentrating on lineup . . . and I know that this failure to scan was my primary mistake," said the pilot. "I could have prevented this accident by proper scan technique, mirror, lineup, airspeed and power."

Concenrating on lineup, the pilot neglected other elements and landed slightly short. Smoke effect below wing in final photo is actually fuel from ruptured tanks.

BRAKING POINT — "Experience with the F4D has proven that regardless of a wet or dry runway the most efficient braking action is accomplished by use of aerodynamic braking until speed is reduced below 90 knots. At this point, or where 3500 feet of runway remains (whichever comes first), the nose wheel should be lowered onto the runway. Once the full weight of the aircraft rests on all wheels, and not before, constant hydraulic braking will be initiated . . . "

This comment from a squadron commanding officer followed an accident where the pilot landed in a steady rain, held the nose wheel off the deck and at 110 knots commenced light hydraulic braking. Some 1500 feet after touchdown the F4D splashed through a large puddle and immediately after passing back onto a relatively drier section the starboard tire blew out. "It was apparent," said the accident board, "that the right brake was locked while passing through the water although only light pressure was being applied to the brake pedal. Friction on contact with the drier segment of runway was sufficient to cause the right tire to fail . . . "

In an attempt to correct a right swerve the pilot applied excess left brake, finally causing the left tire to fail. About 1000 feet later the aircraft ran off the right side of the runway at 80 knots. *For more on braking, check "The Long and Short of It,"* APPROACH June '57.

Do It Now!

During a landing at an outlying field the port wheel of an S2F hit a wooden post located in the approach zone.

The pilot stopped the aircraft, examined it and found to his relief that there was no damage. He then obtained a saw, strode grimly out into the approach zone and sawed the post off.

S. O. P.

'SMOOTH' OPERATING PROCEDURE

SEEMS like we're always screaming about taking care of this or that and operating something else like it should be operated or in general just talking about something that may seem a little remote to most pilots. We're going to talk a little now about something that is very dear to the hearts of us AD drivers: namely, the 3350.

Lately, we've noticed that not all of our proud, stable, full of iron-mailed knights, are getting it cranked through 16 blades before firing it up. Remember, the rod you might bend might not give up on your hop or even the next one; but it could hang together for several hours before it starts to go "thunk, thunk."

Also, remember to gripe the backfires and afterfires you incur on starting the engine. Cracked intake pipes and blown out pipe seals, broken carburetor diaphragms and automatic mixture control bellows, bent alternate air doors and torn exhaust stacks are a few results of backfiring and afterfiring, which in turn can give you detonation, power loss due to intake leaks, improper fuel metering, and fire hazards of exhaust leaks. Any of these could shorten your next hop and change your point of landing.

● While we're at it, a few more of these old axioms need repeating:

● Always use full power for takeoff. Aircraft is airborne sooner, higher airspeeds give better cooling, high power is reduced sooner resulting in fewer piston ring miles.

● Keep 1 inch mp on the engine for every 100 rpm on letdowns, whenever possible (exclusive of landings). Saves rods, bearings, reduces wing flutter.

● Remember blower shifts are made at 1600 rpm and 20", not in a climb with normal rated. A twisted tail shaft is about as useful to good ignition as a wet noodle to a pole vaulter.

Last but not least, be *smooth* on power application *as well as* reduction. A large percentage of recent 3350 failures have been traced to inertia loads placed on the engine by some lightning armed, heavy handed individual who thought probably that because it didn't cut out that he hadn't hurt it. There's no Holley Fuel Control, so be smooth.

The 3350 will take a small amount of "normal" abuse, but not the day-in, day-out thoughtless neglect that some throttle jockeys impose upon it. Be alert for any signs of possible engine malfunction or impending trouble. Remember to note on the yellow sheet any abnormalities in engine operation noticed on the flight. A rough engine can have more serious consequences than a dented ash tray or a cracked mirror. — *ATU-301 "Chock Talks"*

Continued from preceding page

THRUSTRATED—Completing the air work on his fifth familiarization flight a pilot of an A4D returned to base, made one touch-and-go landing, then called for a final landing. Approach and touchdown were normal with speed brakes opened shortly after touchdown and landing flaps pulled up. "After letting the airspeed drop to about 80 knots," said the pilot, "I started normal braking action. . ."

Actually the jet was not decelerating normally. It was estimated to be at 80 knots when passing the first set of arresting gear cables 2200 feet from the end of the runway. Several hundred feet past the "cross-deck" pendants the pilot realized he was faster than usual and commenced heavy braking.

A second arresting gear was rigged 1000 feet from the runway end. The aircraft was slowing down "but not enough," observed the pilot. "It was just then that I started applying more brake and decided to drop the tailhook just as I crossed the arresting gear, which was then too late for that. . . When I came within 500 feet of the end of the runway it became evident that the aircraft couldn't be slowed enough to make a normal turnoff at the end.

"It was then that I made a transmission to the tower that I was going to the end and tried to turn the aircraft toward the taxiway and shutdown the engine." After turning slightly the A4D rolled off the end of the runway into a stone sea wall and up on its nose.

Following a preliminary examination, the investigation continued to ascertain why, with all aspects of the landing otherwise normal, the aircraft arrived at a point late in the landing roll at a speed considerably higher than normal.

The accident board concluded that the only way for the aircraft to be at such a speed was for an abnormal amount of engine thrust to be acting against the aerodynamic braking effect. To establish more accurately the effect of engine thrust on landing rollout characteristics, several evaluation flights were conducted. The results indicated that the aircraft in question had about 65 percent rpm acting against the brakes. No mechanical malfunctions were found in either the throttle linkage or fuel control.

". . . Most significant factor in this accident," said the board, "was the failure of the pilot to recognize the fact that his aircraft was not slowing properly. Had he realized the situation earlier, the possibility of excess throttle might have become apparent and throttle reduction the only course of action necessary. . ."

"Also, if anytime prior to the last set of arresting gear cables (1000 feet from the end) he had dropped the tail hook, the accident would probably not have occurred."

High, Hot and Heavy

In summers past, considerable emphasis has been placed on jet engine power loss due to higher runway temperatures. Even so, the first hot spring or summer day usually finds us having at least one premature gear retraction or similar takeoff bust somewhere. So, for the proverbial 2 percent who miss out on the word, here are the thumb rules of power loss.

Hot Weather Takeoff Thrust (Jet)

Compressor Inlet Temperature (°F)	You get	% of Thrust Available at 100% RPM
120°	" "	81.6%
110°	" "	83.9%
100°	" "	86.9%
90°	" "	89.7%
80°	" "	92.9%
70°	" "	96.3%
59°	" "	100.0%

Of course power loss isn't the only summer aviation problem! A rather new one is the exploding of tires and wheels. These hazards, which have caused fatalities to crewmen and strike damage to aircraft, are increased by summer temperatures. ComNavAirPac dispatch (062001Z) of April, 1959 quoted in part below, is of interest in preventing this type occurrence.

"Extensive use jet aircraft brakes has resulted in an increasing number accidents due to tire/wheel explosions. All units flying high performance aircraft will observe following:

a. Aircraft that have experienced heavy braking on aborted takeoffs or "hot" landings will be parked in an isolated area clear of runway with minimum taxi and shut down.

b. Do not inspect landing gear in either case for at least 30 minutes to eliminate possible personnel injury . . ."

Symptoms of a Cylinder Failure

JUG OUT?

IS IT a cylinder failure or isn't it? That is a question which sometimes arises when an engine malfunctions.

In any discussion of what constitutes the loss of a single cylinder, whether judged from BMEP indications or by other instrumentation, several factors must be considered. These include engine type, model, and power output at the time of the failure. On a non-compound engine this can be done by dividing the BMEP by the number of cylinders to get the approximate BMEP delivered per cylinder.

Here is an example with a few simple calculations to see what this might mean: R2800 engine, cruise power 1100 hp, 155 b.m.e.p., 2050 rpm, 32" m.a.p., 515 pounds fuel flow. Under these power settings if a cylinder failed you would expect to see a loss of approximately 8.6 b.m.e.p. (155 b.m.e.p. ÷ 18 cyl. = 8.6 per cylinder). This would also be a loss of approximately 61 hp (1100 hp ÷ 18 cyl. = 61).

For a moment disregard manufacturers' limitations and operating techniques to theorize how else you could confirm the loss of one cylinder. Under the above conditions the engine was developing 1100 hp at 32" m.a.p. so this is 34 hp per inch of m.a.p. If you were to gain back the 61 hp lost, it would require approximately 1.8" more m.a.p. Considering 1100 hp at 515 lb. fuel flow you would have a specific fuel consumption of .47 lbs. per hp/hr (515 + 1100). If this lost 61 hp was gained back by over-boosting the remaining cylinders then the fuel flow increase would be .47 times 61 hp or about 29 pounds increase.

There probably still would be several other indications to reveal a cylinder was out. You would expect to see fluctuation of b.m.e.p., prop breaking sync, be able to feel roughness and if it were a structural failure, see oil quantity start dropping. On the compound engine there are some other factors to consider that considerably complicate the picture. For purposes of discussion, consider a DA engine at takeoff power. Apply the same thinking as before and say 3250 hp ÷ 18 cylinders = 180 hp per cylinder and 265 b.m.e.p. ÷ 18 = 15 b.m.e.p. per cylinder. This is not correct, however, because 40 b.m.e.p. of the 265 is being delivered by the PRTs. This would indicate then that the cylinders were putting out 2850 hp or 225 b.m.e.p. which would change the picture to about 158 hp and *12.5 b.m.e.p. per cylinder.* If a valve failed it is likely that one of the PRTs would be damaged so 40 b.m.e.p. ÷ 3 = *13 b.m.e.p. per PRT unit. This 13 b.m.e.p.* added to the *12.5 per cylinder* would add up to approximately *25 b.m.e.p. loss* under this condition.

As this discussion is only to stimulate a little thought you can see that there are a vast number of different conditions that could give different indications. The ambient run-up is a very useful tool in determining if a cylinder is out prior to takeoff. By comparing an engine's rpm, b.m.e.p., and fuel flow with the other engines and knowing what an engine normally develops on rpm and b.m.e.p., it is possible to determine if a cylinder is out in only a few seconds of run-up time.

On flight origination, if these figures are recorded, a few seconds' time at each station prior to takeoff will be sufficient to tell if all is well. The foregoing is not to be construed to operate with a cylinder out. Any previous limitations and instructions are to be followed in order to observe the manufacturer's limitations. This is only offered in the hope that it will make it easier to recognize dead cylinders.—*TWA "Flite Facts"*

The Formula:

BMEP ÷ NUMBER OF CYLINDERS = OUTPUT PER CYLINDER

'Had Gun...'

AN F4D-1 made a wheels up approach and landing on Runway 7R. Duty runway had just been switched from Runway 25 and an alternate wheels watch was posted with paddles and flare gun. Wheels watch gave a waveoff with paddles and attempted to fire flare, but the flare gun was *empty*. The aircraft skidded to a stop 1374 feet after contact, resting on the two external fuel cells and the navigation package, sustaining minor damage.

This accident was caused by the pilot failing to re-check the position of his landing gear after he erroneously assumed that he had extended the landing gear prior to

reaching the 180-degree position. He reported "wheels down-and-locked" to the tower at the 180-degree position.

A contributing factor to this accident was the wheels watch. The runway had just been changed and due to the great length of time required to move the wheels cart, a man had been stationed at the end of the new duty runway until arrival of the cart. This man had two paddles and a flare gun. The paddles were used to indicate wave-off but were not seen by the pilot and the flare gun did not operate due to the absence of a cartridge.

The reporting squadron reemphasized the necessity for positively double-checking landing gear position both at the 180 and 90-degree approach positions and recommended that additional facilities to expedite suitable wheels watch surveillance be instituted. This being necessary because, due to limited fuel supplies in modern aircraft, an orbit of the field for 10 to 20 minutes while changing runways is impractical.

Noteworthy are these comments of the endorsers of the accident report:

First Endorser: This is another case of failure to complete the check-off list. A habit pattern appears to be prevalent in this accident and a large task confronts the Aviation Safety Officers — that of attempting to break the habit pattern and instilling in the minds of the pilots the dire necessity for adhering to the check-off list.

The F4D does not have a warning system, either audio or visual, to alert the pilot that the landing gear handle has not been actuated for a landing approach; e.g., an audio or visual signal to cut in at low power settings. It is believed that a fix of this nature should be considered.

Concur that a more expedient means of transferring the wheels watch should be instituted. The advent of high performance jet aircraft is very demanding on the pilot, especially during the landing phase, and assistance from a wheels watch is highly desirable.

Second Endorser: The accident took place on the first day that the man standing the runway watch was assigned to the Air Station for this duty. An order on the subject of wheels watches has been published and changes the tour of duty for personnel assigned to stand this watch from 30 days to 90 days.

Third Endorser: The system in use at the present time for transferring the wheels watch to a new duty runway is considered to be adequate. When the duty runway is changed, the tower operator notifies the crash crew leader who in turn dispatches the alternate wheels watch with paddles, flare gun and cartridges to the new duty runway. The wheels watch cart is then moved to the new duty runway. In this way, landing approaches are always covered by a suitable wheels watch and no delays are caused by lack of a suitable wheels watch.

Investigation reveals that the alternate wheels watch was dispatched to the new duty runway with paddles, flare gun and cartridges. The alternate wheels watch is considered to have been properly trained in his duties; however, when he attempted to fire the flare gun, he discovered that it was not loaded. The alternate wheels watch simply forgot to check the flare gun to determine whether it was loaded or to load it prior to assuming his duty. The error on the part of the wheels watch is considered to be in the same category as that on the part of the pilot involved. ●

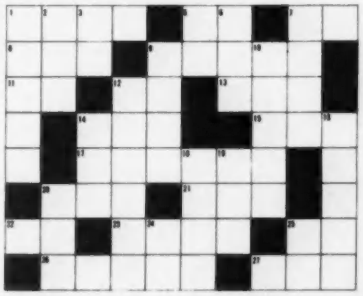
WHIZ QUIZ

ACROSS

1. Up and over
5. Some kinda diagram
7. Nine
8. Clearance for Positive Control Airway
9. Better than ADF
11. Temco makes it
12. Multi-fan carrier types
13. Freq peaker of yore
14. Takeoff time, time over target, turbine outlet temp.
15. Everyone should have some
17. Every NAS should have this landing aid
20. When you figure to shove off?
21. End of 3rd qtr.
22. Ma's mate
23. Many radials
25. Acrobatics in a control zone
26. If you hit the deck hard, this recorded it
27. OpNav Form 3750.1

DOWN

1. 0.26418 U. S. Gallons
2. Almost like the real thing
3. Old VF with recip & jet
5. Attack
6. Pilot's friend
7. Peruvian Indian
9. Go around, not through
10. Gracie Fields sang about this & Walter
12. F-101
14. Test pilots have been through it
16. He gave blood
18. Nav Aid
19. Italian airline
20. 3 times a day
24. He writes in Latin
25. Not applicable



See WHIZ QUIZ answers on page 48

ONE SUMMER EVENI

"The seas were from 3- to 4-foot waves with about 10 to 15 knots of wind from the east-southeast. There were low scattered clouds with build-ups and lightning on the horizon . . . I was bobbing like a cork but the waves would only break over me every few minutes. Although the water and wind were warm, I was chilled by my wet flight suit . . . There were no boats visible in the vicinity. The lights of the coastal cities were only a glow on the horizon . . ."

IT ALL began one summer evening last year. The lieutenant took off from NAS Key West in an F4D-1 as an instructor on a routine night VFR radar intercept flight with two students. The three aircraft climbed to 30,000 feet and began their radar training with the lieutenant acting as target. As he came to a heading of 360 degrees for the third intercept, he heard a loud "Bang" apparently coming from the engine section; the RPM began to drop and the TPT began to rise.

"MAYDAY . . . MAYDAY . . . MAYDAY, this is 114," he called on his radio. "I have a flameout. Am turning toward the base. I will eject at 10,000 feet."

He heard one of his students call GCI. Then his UHF radio went dead.

By this time, his RPM was about 35% and his TPT about 800°. He pulled the throttle around the horn to prevent an explosion or fire. The fire warning light did not come ON. As he continued his turn past 360 degrees toward the lights of Key West, his instrument lights went out and one by one the AC, DC, oil pressure and fuel boost pressure red warning lights came ON.

As he came through the heading toward the Key West lights, he noticed that the lights along the coast of Cuba were twice as close so he continued in his turn around toward them. While still in the turn, he reached back and switched his IFF to "Emergency" unaware that when AC power is lost in the F4D-1, the IFF is also lost. Realizing that he was heading in the opposite direction of his announced intentions, he tried to call again and say he was heading toward Cuba.

By the beam of his flashlight, he checked his altimeter and airspeed and adjusted his glide angle for 220 knots. Although it was a very dark night, he was VFR. He had no trouble keeping his wings level and heading for the nearest lights. Between 25,000 and 22,000 feet, he switched the fuel control to manual and attempted an airstart. The temperature rose immediately and the RPM went to about 35%. As the TPT climbed past 800° he shut down the engine again for fear of fire. He decided to glide on down to 5000 feet to be as near the coast as possible. When it became apparent that he would not be able to reach the coast, he attempted another airstart. Once more, he shut down the engine for fear of fire.

Here is the pilot's narrative of subsequent events:

"At 7000 feet, I was still a long way from the Cuban coast lights, but I noticed what appeared to be a lighted buoy about 30 degrees to my left. I quickly turned toward it hoping I might be able to be near it when I ejected. At 6000 feet I yanked my flashlight from the cord around my neck and stuck it in the lower left leg pocket of my flight suit. I then sat back, released the stick and went through the ejection procedures. I said, 'Pre'—(and realized I had no pre-ejection action to do), 'Pos'—sat back in the seat with heels in the stirrups, 'Ox'—pulled the bailout bottle knob, and 'Pull' and pulled down the face curtain. Altitude was about 5000 feet.

"There was a moment when nothing happened, then a flash of light and I could tell that the canopy had gone. There was another pause and I wondered if I was going to go. The same second there was a heavy force on my body followed by violent pitching. It was completely black and I could see nothing. In another second, I felt straight and was not tumbling. I reached back to see if the seat had left me. I could feel nothing but I noticed a dark object going away from me. Certain that the seat was gone, I began to grope for the parachute D-ring. Before I could grasp the D-ring, there was a 'bang' and I was jerked violently by the opening of the chute. I looked up and saw I had a good chute. Then I tried to remove my oxygen mask. The mask had been pulled down tight against my face by the force of the ejection and was uncomfortable. I tried for nearly a minute to find the snap on my mask but could not. I removed my gloves, stuck them in my upper right leg pocket, and was then able to remove my mask without difficulty. The bailout oxygen hose was still connected.

"I then tried to get into the seat of the harness by lifting myself up on the parachute risers. Almost before starting, I knew this method was useless so I tried putting both hands on the seat strap. With a couple of kicks, I was in the seat and felt quite comfortable. I then reached down and unbuckled the strap holding the raft packet.

"I thought of what to do with my hard hat and decided to take it off and drop it. A few seconds later I heard it hit the water and knew I was get-

Continued from preceding page

ting close. I reached down and pulled the raft packet out, set it in my lap and unbuckled my leg straps. Thinking that I didn't want my shoes if I had to swim in the water, I took off my left shoe. Before I could untie the right one, I could hear the waves below and reached back to grasp the chest buckle of the harness. When I hit the water I released the chest buckle and threw my hands up. I only sank about head deep, and as I bobbed back to the surface, I was free of the harness and could see nothing of the parachute.

"I pulled the toggles on my mae-west and it inflated. Before reaching for the raft packet, I untied and kicked off my right shoe. I followed the lanyard to the raft pack and pulled the toggle to the CO_2 bottle. The raft inflated immediately. I threw in the packet (of equipment) and climbed into the raft. I made myself as comfortable as possible and then began to think of what I might do from then on.

"The seas were from 3- to 4-foot waves with about 10 to 15 knots of wind from the east-southeast. There were low scattered clouds with build-ups and lightning on the horizon. It didn't look like it might storm anytime soon. I was bobbing like a cork but the waves would only break over me every few minutes. Although the water and wind were warm, I was chilled by my wet flight suit.

"There were no boats visible in the vicinity. The lights of the coastal cities were only a glow on the horizon and the lighted buoy that I had seen before ejecting looked a good 5 to 8 miles away, dead into the wind.

"I blew up my life vest with the oral inflation tube in case the CO_2 compartments might leak. I reached for the flashlight I had placed in my leg pocket but it was gone. I used the light on the life vest to look in the pack to find something to use to bail out the water in the raft. I took out one flare to place in my flight suit for ready use and the plastic water bag. The bag was inadequate for bailing—so were a glove and my cupped hands. I finally ended up using the plastic top of my PSK-2 kit that I was carrying in my flight suit. I wanted the water out because it seemed to dissipate my body heat. Unfortunately, the raft would fill up again within five minutes, either from a leak or from the waves breaking over me. It soon became a boring task of constant bailing. Shortly after getting in the raft, I looked at my watch and found it had stopped at 2030. I later threw it away for fear of attracting barracuda while paddling with my arms.

"Within a short while, I decided to make an attempt to paddle toward the lighted buoy. After nearly 20 minutes of paddling, the idea seemed useless because the buoy was so far away and dead against the wind. I then decided to spend the night drifting and save my strength. I pulled the raft poncho around me. I was unable to cover myself completely because I couldn't find the proper snaps in the dark and because I had to bail out the raft so often. After two to three hours of drifting, my back began to ache painfully and I began to suspect that the raft was deflating. It was impossible to keep the water bailed out. I felt cramped and cold. I was certain that there was an oral inflation tube for the raft, but it wasn't where I thought it would be and I couldn't find it by feeling about the raft.

"With the wind still strong and the possibility of the raft becoming useless to me in another two hours, I decided my only chance was to paddle to the lighted buoy and attempt to hang on to it. I began to paddle lying on my back in the raft with my arms over the side. I steered a course by keeping my feet lined up with a star opposite the direction I wanted to go. About every half hour, I would stop and throw out the sea anchor. The line would go taut quickly because of the strong wind. I felt certain that I was making little progress against it. However, it made me feel better to keep paddling even though, after hours, the light didn't appear a bit closer.

"The raft appeared to be only half-inflated now and if I sat up, water would pour in level with the top. I was afraid that it wouldn't stay inflated long enough to make the light. (Later, it was found that the raft was leaking around some patches which had been applied previously.) I thought perhaps I might be able to make better progress by swimming in the water and dragging the raft so I jumped out and began to swim. It wasn't long before I realized that this was a lost cause. The raft was too much of a drag and the waves breaking over my head caused me to swallow too much water. I climbed back into the raft, threw out the sea anchor and tried to rest.

"I estimated the time to be about 0230. Then as I looked at the horizon toward Cuba, I saw the navigation lights of two boats. It looked as if they might pass in my vicinity. I began to blow the whistle on my vest and yell. When I thought they might be able to see a flare, I lit one. Both boats continued to come closer and I lit a second flare. A spotlight came on from the larger boat and began to arc across the water in my direction. I continued to blow the whistle and yell as they headed in my direction. When I was certain they would obviously see a flare, I lit a third and the

spotlight from the boat flashed directly at me. I waved frantically and I knew that I was saved.

"I waited patiently to be picked up, but in a minute I realized that the boats were not stopping but continuing on. I blew the whistle and yelled till I hurt, but they went on. It took me a few moments to get over the bitter disappointment of not being picked up by the boats. With the raft sinking around me, there seemed little chance but to continue for the light.

"As the hours went by, I began to see that I was making some progress toward the light and I stopped to rest less frequently. I actually felt stronger, even though my arms ached and were beginning to get raw from rubbing against the side of the raft. As the sky grew light in the east, the wind decreased and my progress became more evident. Dawn came on and I saw that the lighted buoy was in reality a lighthouse. With further light and progress, I saw that it was on an island and estimated it to be about four miles away. Later I learned the island was Cayo Piedros.

"With the dawn light, I found the oral inflation tube for the raft and blew it up tight. This made the paddling considerably easier. I covered the remaining miles within another hour and landed on a coral rock about one-eighth of a mile from the main island. Two fishermen in a boat near the island either didn't hear or just didn't heed my calls so I started to walk across the coral rock and wade to the main island. Because of the sharp jagged edges, the rock was extremely painful to my feet and I dearly wished for my shoes. I was weak and wobbly but I could walk fairly well by picking my way carefully.

"A boat full of fishermen came out from the main island and circled around the rock. I waved for them to pick me up. They went around to the other side and landed so I had to struggle back across the torturing rock again.

"I climbed aboard their boat with my gear and they started back to the lighthouse island. No one spoke English but I made them understand how I had come to arrive on the rock. Apparently they had heard the crash of my aircraft the night before and understood that I was the pilot.

"Within an hour, they had given me breakfast, a cot on which to rest and clothes to wear while mine were being dried. I estimated that I landed on the island about 0630. Although the fishermen had no communication with the mainland, they gave me to understand that I would be taken to the mainland sometime that day.

"While I was resting, I saw an aircraft flying low in the area in which I had gone down. I went out in an open area to wait. Within a few minutes, a UF model aircraft came toward the island and I lit off two smoke flares. The aircraft circled the island and with my equipment lying about and a poncho spread out, I was certain the pilot recognized that I was safe.

"Later other aircraft were circling including a Cuban PBY which landed next to the island. (The Cuban pilot later told me he spotted an oil slick where my aircraft had gone in.) The fishermen took me out to the PBY and I went aboard. I was flown to Havana, transferred to a Navy UF and taken to Key West.

"In closing I'd like to note that some of the factors that helped me the most were the confidence that I had in my survival equipment and the fact that I knew every effort would be made by my unit to find me. I had considered before what my actions might be in such a situation and fortunately the events took place and the equipment worked according to plan. The things that I didn't accomplish were those that I hadn't given much thought to—for instance, switching the battery generator switch to BATTERY ONLY after I had made my initial call would have given me the use of my radio again and I could have made continuous calls of my position and intentions. Another thing—the navigation lights were lost with the AC power failure, but I could have had them back on by switching them to the dim position. Then perhaps the two student pilots could have been able to follow me.

"It had been nearly two years since I had examined the contents of the pararaft pack thoroughly," the pilot continues. "This probably accounts for my inability to find the raft's oral inflation tube in the dark. Although I felt confident in the use of the ejection seat and parachute, it had been too long since I had examined the pararaft. I would like to recommend that each pilot examine the articles of his pararaft equipment at least once a year."

The AAR praises both NAS Key West Search and Rescue and the pilot in this accident:

"Considering the time of night and the distance from Key West, the extent of the search is a confidence builder to any pilot flying in this area."

(NAS Key West Search and Rescue went into action at 2025, five minutes ahead of the time the pilot, judging by his stopped wristwatch, estimated that he hit the water. An AD, UF, S2F, P2V, P5M, ZP6, two SNBs, eight helicopters, a Cuban PBY and four DDRs took part in the search, working from the pilot's last known position.)

"It is considered that LT W did a commendable job in his (survival actions)," the AAR continues. "The items he overlooked are considered to be far outweighed by the positive pre-formulated 'plan' he had in mind."

NOTES FROM YOUR FLIGHT SURGEON

Hot Pilot

A STUDENT pilot had trouble regulating the aircraft heat control in an F9F-5 shortly after takeoff on a routine training hop. After radio discussion with his instructor he decided to continue the flight. However, the student subsequently became very hot and dizzy and at 21,000′ suddenly went into a dive.

The instructor followed him down and finally succeeded in contacting him by radio at 10,000′; he instructed the student to go on 100% oxygen and fly around for awhile. The student responded sluggishly but complied. After 20 minutes on 100% oxygen, the student was guided down, landing in a semiconscious state and making no effort to brake the aircraft which dragged the wire more than 1000′.

After the aircraft had landed, it was discovered that the student pilot, thinking that the cabin heat control was working backward, had turned the control up to full hot. He had received a first-degree burn on his left thigh where he was struck by the continuous blast of hot air.

What made the student pilot think the cabin heat control was working backward? A combination of hypoxia and a 17% CO blood saturation found after landing could very well be the answer.

The young pilot was wearing his oxygen mask loose because of a sore on his nose caused by improper adjustment of the mask on previous flights; this was the source of his hypoxia. When he warmed up the aircraft he did so while on normal oxygen with the cockpit open. This exposed him to the exhaust gases from a number of other jet aircraft warming up in front of him and accounted for the 17% CO blood saturation.

(While warming up an F9F-5, the pilot normally keeps the cockpit closed, turns on the heater and breathes normal oxygen. In this way he can "sniff test" the blower for gasoline fumes.)

Keep CO_2 Cool

LAST July, the pilot of an F4D-1, forced to ditch his aircraft off the coast after engine failure, found that the CO_2 cylinder of his pararaft failed to function properly. He inflated his pararaft orally and paddled to shore. Subsequent investigation showed that the safety seal on the CO_2 cylinder valve had ruptured since the last inspection of the cylinder. A temperature-caused pressure build-up inside the cylinder was considered as a possible factor.

During hot weather, parachutes equipped with pararafts should not be left in the closed cockpits of jet aircraft in direct sunlight on the line. The temperature build-up in these cockpits is considerable, reaching 140° to 170° F. in a relatively short time. Such temperatures can cause a pressure build-up inside the CO_2 cylinder sufficient to rupture the cylinder valve safety seal.

Since parking your jet in the shade is usually next-to-impossible, you have two choices: You can take your chute pack out of your aircraft when it is in the sun or you can have someone keep your canopy cracked to prevent the temperature from building up in the cockpit.

Weekender's Duty

A WEEKEND warrior on his annual two-week cruise wore a chest binder because of "cracked ribs" suffered the week before he reported for active duty. The squadron flight surgeon was unaware of this until the pilot became involved in an accident.

Although the pilot's previous rib injury had no bearing on the accident, the flight surgeon has some comments on this kind of situation. He is of the opinion that weekend warriors are much more apt to conceal serious physical defects when ordered to their annual training cruises as they are reluctant to miss such an important period of their training.

Any pilot or crewman who is not in first class physical or mental condition has no business flying.

.38 Caliber Pistols, Tracers

EVERY pilot and crewman who flies over water, especially at night, should give serious consideration to obtaining and carrying a .38 caliber pistol and tracer bullets. In a number of survival situations on record at the Naval Aviation Safety Center, pistols and tracer bullets have saved lives.

To obtain this equipment, the squadron materiel officer should submit a requisition to the ordnance section of the squadron's supporting activity. The stock number for a S&W .38 caliber pistol is ZX 1005-726-5659. The stock number for the holster is Z 1095-714-2700. Tracers to fit this pistol (12 to a box) are listed as Cartridge Caliber .38 Tracer, Special Jacketed, stock number, 1305-000-0012-A406.

For complete information on tracer ammunition, see NavOrd publication O.D. 12067-P which lists stock numbers and types of pack.

Duty

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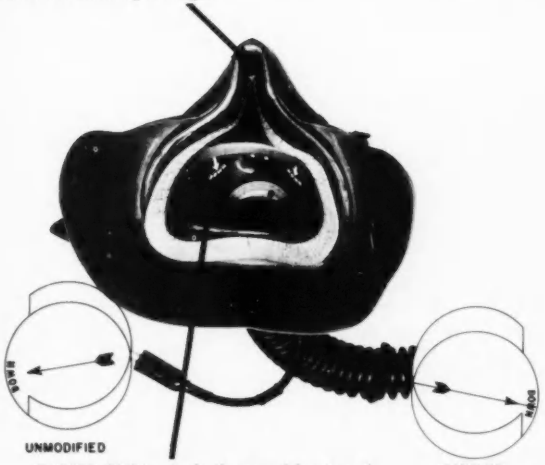
on borrowed time...

A LTJG flying a TV landed at a naval air station for a passenger stop. En route he had almost passed out at the controls on normal oxygen. Subsequently, he went on 100 percent oxygen, "came to," and made a successful landing. The duty parachute rigger was called to check the oxygen equipment.

The regulator and aircraft oxygen system checked out OK. However, examination of the pilot's oxygen mask showed that it was leaking where the laminated seal had separated from the mask. On further inspection, a number of other discrepancies were found (see photos). The pilot told the rigger that he knew the mask was the cause of his oxygen troubles because it had happened to him before. To top it all, *the oxygen mask did not even belong to the pilot—he had borrowed it.*

From previous experience with the borrowed mask, the pilot knew it leaked. "It has happened before," he states. FOR IT TO HAPPEN EVEN ONCE IS ONCE TOO OFTEN. THE VERY FIRST ENCOUNTER WITH HYPOXIA COULD VERY WELL BE THE LAST.

Laminated Sealer installed according to BACSEB 8-55 but sealer has pulled away from mask allowing leakage.



UNMODIFIED

MODIFIED

BACSEB 50-54 sets forth a modification of the inhalation valve by scoring an indentation on the valve cover. Valve on right complies with this. Valve on left does not comply. (See enlarged sketches below mask)

Does not have Hardman Suspension System as required by BACSEB 17-58.

MC3A Connector Modification has been installed complying with BACSEB 29-57.

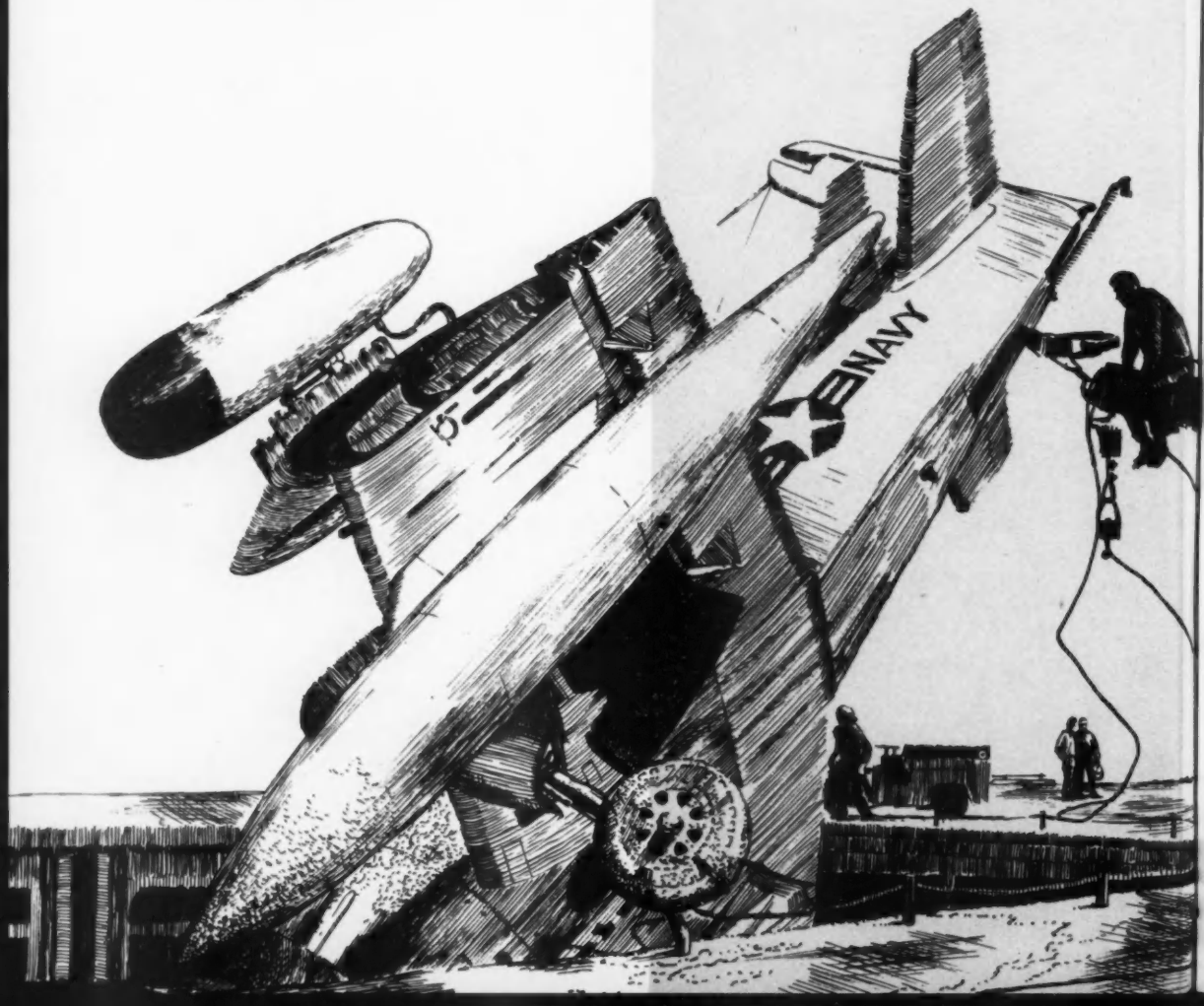
Does not comply with Electronic Material Change 163-5[illegible] of 11-9-54: Oxygen Mask Microphone Assembly ANB-M-C1. Mike cord should be longer.

Borrowing or lending an oxygen mask is an unwise practice. The borrower doesn't know the condition of the mask and chances are that the mask won't fit properly. The lender doesn't know what condition his mask will be in when it is returned to him, and, in the meantime, he might need it himself. In addition, using someone else's oxygen mask is hygienically unwise.

All pilots and crewmen should have their parachute riggers check their oxygen masks to make sure that all bulletins applicable to the oxygen mask are being complied with. If any malfunction of the mask is suspected, the mask should be checked by a parachute rigger or flight surgeon immediately. Care of the mask is the individual custodian's responsibility. Maintenance and modification of the mask are the parachute rigger's job.

STRIKES and SPARES

Salvage of aircraft can range from a process of restoring a slightly damaged airplane to the pick-up and disposal of a "Strike." The process begins the moment the crash alarm sounds and ends with final disposition of the airplane. The problems involved vary with circumstances surrounding the accident and affect varying numbers of people. Because so many of the applicable directives are scattered throughout a number of publications APPROACH brings into focus those rules which can apply to crash recovery.



The complexities of new aircraft and modern equipment are such that a failure is much more critical than in older, slower aircraft and hence more apt to result in an accident.

WHEN the electrifying sound of the aircraft crash alarm pierces the din of operational activity three teams are spurred into action to carry out a well-organized pre-accident plan . . .

TEAM NO. 1: *Crash and Rescue*—The helicopter, firefighting crew, crash and rescue vehicles, sometimes crash boats—all get underway to accomplish their primary objective—*to save the crew!* It's too late now to make a study of the airplane to determine the best methods of lifesaving and firefighting. Knowing this, the team has long prepared and rehearsed in anticipation of virtually every conceivable type of crash. You can count on them. Years of experience have been compiled into NavAer 00-80R-14, the U. S. Naval Aircraft Fire Fighting and Rescue Manual. This is their guidebook.

TEAM NO. 2: *Crash Investigation* (Aircraft Accident Board)—This team promptly proceeds to the scene of the crash to determine the cause of the accident, and to discover any malpractices and faulty procedures or equipment associated with the cause. No matter how minor the accident the investigation is to get the facts, "man," not just the apparent facts, but the actual facts. They know well that an incomplete investigation resulting in erroneous conclusions nullifies the only possible benefit which could be derived from a costly and possibly tragic accident. This four-member team is composed of highly trained naval aviators and a medical officer, usually a flight surgeon. They're all well checked out and are guided by NavAer 00-80T-67, the Handbook for Aircraft Accident Investigators.

TEAM NO. 3: *Salvage Crew*—Their mission: stated simply, recover the airplane. However, the job isn't as simple as it sounds. This team is sometimes made up of members representing every specialty in naval aviation. Other times it can be, relatively speaking, a handful of men. Who, what and how many are often determined by the senior member of the aircraft accident board. His decisions will be based on such factors as model aircraft involved, extent of damage, type of crash (land or water), accessibility to the crash site, distance from base, type of terrain, facilities available and so on.

Guidelines for the first two teams are established in manuals but the salvage crew's "modus operandi" is less well defined. Operations of this team are dictated largely by the salvage officer who in turn, takes his orders from the senior member of the accident board. The salvage officer relies on experience and ingenuity and must have an excellent working knowledge of seamanship, rigging, and aircraft construction if his team is to accomplish its mission successfully. Knowledge of the rules governing crash investigation people and others concerned with crashed aircraft will help.

Here is a roundup of excerpts from various sources which offer guidance in the recovery of "strikes," as well as "spares."

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Procedures at the Scene of the Accident —NavAer 00-80T-67

Officer-in-Charge: OpNavInstruction 3750.6C* specifies that the surviving crew members (if physically capable of so doing) or the first military person arriving at the scene of the accident will place the scene of the accident under an adequate guard pending investigation and salvage.

In many cases, it may be possible for members of the Aircraft Accident Board to accompany the search-and-rescue party to the scene of the accident. The senior member of the board present at the scene should determine who is in charge. Unless a responsible and competent officer is in charge, the senior member of the board present should take charge immediately.

Safety of personnel involved is of primary concern in every aircraft accident. The officer-in-charge at the scene of the accident will insure that all occupants of the aircraft are removed from the wreckage as expeditiously and safely as possible, using the most effective means of rescue available.

Immediate steps must be taken to prevent injury to personnel at the scene of the accident due to explosion of fuel, cook-off of armament, ejection seat charges or other explosives, fire, or other additional hazards present. The most effective means of providing security in these cases is to place guards around the scene at a distance from the wreckage sufficient to insure protection for personnel in the event of explosion and resulting flying debris.

There are several details that require immediate action at the scene of the accident after the requirements for the safety of personnel have been met. Examples of such details include:

a. Obtain necessary medical services, not only for treatment and disposition but also for the purpose of isolating factual information on human failure.

b. Secure the wreckage against the hazards of fire or further damage.

Caution: Operational jet aircraft are equipped with seats which contain highly explosive charges. These seats should never be disturbed or tampered with until they have been examined, disarmed, and declared safe by qualified armament personnel.

c. Insure that the wreckage is not moved or tampered with except as necessary as indicated above.

d. Obtain necessary guards for the security of the wreckage and classified equipment.

e. Obtain names and addresses of all available witnesses present at the scene of the accident.

f. Supervise the work of the photographer to obtain the general views of the scene of the accident.

g. Insure that the message reports of the accident are transmitted by the reporting custodian or the nearest military base commander in accordance with OpNav Instruction 3750.6C.

h. *Maintain positive military control of the salvage crew to insure that salvage operations do not commence until the senior member of the Aircraft Accident Board releases the wreckage for salvage.*

i. Estimate the number of men and any special equipment that will be needed in recovering wreckage from the area of wreckage distribution and from the location of the main body of the wreckage.

Development of Access to Area

Following inspection of the crash site a review should be made by the salvage officer summing up the obstacles and assets. Based on this information, a plan of development should be drawn up which should minimize or eliminate objectionable features from a salvage standpoint and develop and improve features which may facilitate operations.

The development will center around improving access to the area to permit the passage of vehicles. Platforms may be required over ditches, ramps may be constructed over obstacles, sharp crests, or slopes; bridges may require minor strengthening or even rebuilding.

* This instruction will become OpNavInst. 3750.6D in the near future. Revisions to .6C which will appear in .6D and are pertinent to salvage are included in these excerpts.

Even in cases of total aircraft destruction members of the accident board supervise the recovery of wreckage, for while there are obviously no salvageable parts, there are always important clues which only the trained investigator can find.

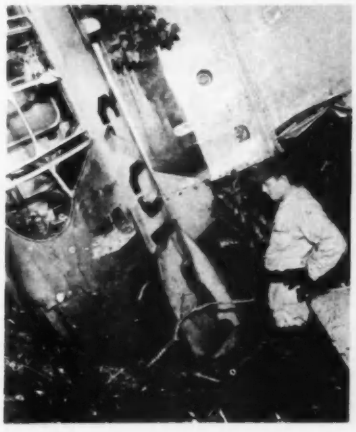
Wreckage Recovery: The problem of recovery of aircraft wreckage can be divided into two different categories, namely the recovery of wreckage on land and the recovery of wreckage under water. Of course, there are variations on each of these two categories when accidents occur in swamps, mountains, etc. Generally the two principal categories have definite recovery methods which will insure that all available parts are recovered. Except in special circumstances wreckage must not be moved until released by the senior member of the accident board (see excerpt "Movement of Wreckage" from OpNavInst. 3750.6C next page).

Recovery of Wreckage on Land: Recovery of wreckage on land is often a laborious task. After wreckage distribution diagrams, preliminary inspections and photos have been made, the following steps should be accomplished:

a. Have a search party carefully pick up each part. This work party should be composed of the best qualified men available, properly equipped with suitable work clothing, cardboard boxes, and gloves. The working party should be instructed to pick up all parts. Do not let any member of the working party make decisions as to which parts to pick up; this is a problem for the accident investigator. *The working party should be instructed to handle each piece of wreckage carefully to preserve evidence.*

b. Search back along the flight path for any

Left: Guards are posted promptly for security of the wreckage and classified equipment. Right: Photographic records of the scene, wreckage and failures must be made before wreckage is removed.



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parts that may have separated from the aircraft before it crashed.

c. Care must be exercised to see that all damage is catalogued before the wreckage is moved in order to differentiate between salvage crew damage and crash damage. Members of the accident board should supervise the movement of the wreckage in order to prevent unnecessary damage by the salvage personnel.

d. A complete investigation may necessitate that components such as the engines or parts of the airframe be shipped to an O&R department for detailed analysis. Extreme care must be exercised in removing the assemblies. *Salvage is the responsibility of the closest naval air station whose equipment may be augmented by local agencies.* The nearest Air Force, Army, National Park Service, county agent, or local contractors can be solicited for assistance.

Locating the wreckage is the first problem.

When wreckage is under water the problems of location and recovery assume major proportions.

Divers not having aviation experience should look to investigators for assistance and guidance.

Recovery of Wreckage Under Water: When aircraft wreckage is under water, the problems of location and recovery assume major proportions. Special facilities are available which may mean the difference between success and failure. The following steps will aid in investigations involving under-water wreckage.

a. Location of the wreckage is the first problem. This may be accomplished by carefully plotting the location described by witnesses. Another method is to look for oil bubbles, which often continue to escape even days after an accident. A third method is by dragging or sweeping the area. Mine-sweeping activities have special equipment which is designed for the location of objects under water.

b. After the wreckage has been located, the

divers should try to sketch the location of identifiable parts. The divers and other salvage personnel may not have aviation experience and the investigators should extend all assistance and guidance possible.

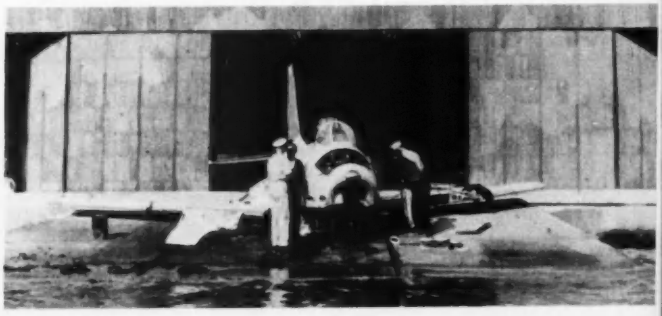
c. During the recovery operations a member of the accident board must be able to supervise, answer technical questions, obtain photographs and categorize damage inflicted during recovery operations. A proper record of damage sustained during salvage will eliminate confusion in future analysis. The wreckage should be flushed with fresh water to reduce the effects of salt-water corrosion. Parts to be disassembled should be placed with the inspection agency as soon as possible to reduce the effects of corrosion to a minimum.

Movement of Wreckage —*OpNav Inst. 3750.6C*-

a. Following an aircraft accident the wreckage shall not be moved or disturbed for a period of 24 hours, unless the wreckage interferes directly with essential military operations or vital civil functions. In case of interference, the commanding officer of the base or unit concerned is authorized to direct the removal of the wreckage from the scene of the accident to the salvage yard or to an area where there is no interference. The 24-hour period is necessary to allow time for other agencies of the Department of the Navy to receive dispatch notification of the accident and make decisions relative to their interest in conducting an independent investigation of the accident.

After summing up the obstacles and assets of the crash site, salvagers . . .

. . . found Mary Ann to be the best bet to recover the AD, left.



. . . dragged this FJ jet up to a seaplane launching ramp.

Preservation of Wreckage Evidence: Unless it is absolutely necessary, the wreckage should not be disturbed until the investigators have gleaned all available information and evidence. Removal of wreckage is authorized only after all evidence is known. Care must be taken to assure that parts are not removed to the salvage yard and indiscriminately dumped with other wreckage. The Accident Board must complete its report before the wreckage is released for final disposition.

b. When the wreckage is moved prior to investigation by the aircraft accident board, it is the responsibility of the individual ordering the removal to insure that an accurate plot of wreckage distribution has been prepared. A photographic record of the wreckage, including any known material failures, and of the scene of the accident is made before the wreckage is moved. In moving the wreckage in these cases, *every effort must be made to prevent further damage. A record*

Continued from preceding page

of any damage to the wreckage inflicted during rescue or salvage must be maintained.

Note: O&R people, Tech Reps and other specialists get best results when it's possible for them to get to the scene early. They can tell a lot more from an immediate on-the-scene investigation, than they can after several people have climbed over the wreckage or it has been moved. Whenever parts or instruments are sent to an O&R or other laboratory, pack them as carefully as a new part. Too often instruments and parts arrive for analysis in such condition as to make it difficult for the analyzer to tell whether the damage occurred during the crash or shipment.

Type E Preservation —*NavAer 15-01-500 Section XII*

Type E preservation procedures apply for all aircraft that have crashed in salt water or have been subject to the application of fire fighting foam or chemicals. The procedures shall be followed as soon as possible after recovering the aircraft from the water or extinguishing the fire, depending on release of such aircraft by any inquiry board.

The basic purpose of Type E preservation is to insure that the greatly accelerated corrosive action induced by salt water, fire fighting chemicals and their residues is arrested and the resulting corrosion damage inhibited. Such action must be taken as expeditiously as possible in order to be effective, since in the majority of instances the extent to which overhauls and replacement of parts is required is determined largely by the efficiency and promptness with which the instructions in this section are put into effect.

Essentially, Type E preservation consists of removing all traces of salt water, salt deposits, or fire fighting chemicals; washing the affected items; and preservation by the application of specified compounds of oils. This section contains instructions which establish standard cleaning, preservation, packaging, and packing procedures for aircraft and aircraft materials that have been involved in salt water crash damage or subjected to fire fighting chemicals.

FIRST THINGS FIRST

An AD model aircraft left the port side of the runway during takeoff coming to stop inverted in soft muddy terrain trapping the pilot in the cockpit. No fire ensued. The MB-1 crane was unable to get into lifting position due to the soft terrain. The crash crew dug out the still conscious pilot with hand shovels in 20 minutes.

Subsequent to this accident tests were conducted using pneumatic lift bags to raise the aircraft to effect rescue. It was determined that recovery could be made using one lift bag in conjunction with a sled-mounted platform 30 inches in height. In cases where a crane cannot be utilized, this method is

Note: Clean, dry surfaces being treated during Type E preservation are not to be permitted to remain uncoated due to the lack of specified preservatives. Any clean, unused light oil may be substituted as a preservative during such emergencies. The application of light oil is far better than the application of no preservative.

Note: All parts removed from the aircraft should be tagged with the special "Salt Water Crash-Fire Damage" tag. The tag is to remain with the part until completion of preservation measures after overhaul.

Safety Precautions—In general, and particularly in those instances where fuel tanks and cells have been ruptured and free fuel or vapors are present, it is imperative that the Fire Chief or his authorized representative specify acceptable purging procedures and certify that the aircraft is fire and explosion safe before beginning Type E preservation activities. Only qualified ordnancemen are permitted to handle all ordnance and allied items such as ammunition and pyrotechnics.

Obliteration of Marking of Abandoned Wrecked Aircraft— *OpNav Inst. 3710.7A, 31 Dec 1956*

a. It is the responsibility of the salvaging authority to assure that aircraft wreckage not considered salvageable be completely obliterated or spotted and photographed. OpNav Inst. 3710.7A specifies the following procedure:

(1) Wreckage shall be burned and residue buried when type of terrain and accessibility permit. Every precaution to prevent forest fires shall be taken.

(2) Dynamiting or bombing in an attempt to scatter wreckage shall be considered for sites where burial of wreckage is impracticable. Every precaution to prevent forest fires shall be taken.

(3) When neither procedure outlined in (1) and (2) above can be employed, the position of the wreckage shall be plotted and photographed from as low an altitude as practicable. All air search agencies shall then be furnished with the exact location of the wreckage together with photographs showing the configuration of the wreckage.

Please turn page

recommended. Inflation of the lift bag requires seven minutes, therefore, concurrent all-out effort with a shovel brigade is considered essential. It was found that the lighter 6-wheel drive Stirling crane operated under identical conditions with relatively little difficulty.

Now, a bomb trailer carrying an adequate supply of Marston matting to afford traction to vehicles is being kept immediately available on the hardstand.

Pallets have proved quite effective for this purpose also. A Connie was extricated from a drainage ditch by using lift bags and wheeled out on a roadway of pallets to solid terrain.—Ed.

1. Terrain was too soft to support MB-1 crane—the problem: raise the fuselage to free a trapped pilot.

2. Marston matting used to support A-frame hoist permitted the fuselage to be raised sufficiently to place lift bag between ground and fuselage.

3. Lift bag at full deflection. Cockpit area clearance is sufficient to release pilot.

Below—Use of the power saw to gain entry into the cockpit:—Tests indicate that the armor plate removal and fuselage cuts can be accomplished in three minutes. However, the calculated decision to use the power saw will necessarily rest with the Crash Captain predicated on the existing hazard of cutting sparks producing a fire/explosion.

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Procedures for Damaged Aircraft

—BuAer Inst. NavAer -.00.38A

a. *If obviously beyond rework*

(1) When an aircraft is damaged or defective and determined to be obviously beyond rework, the major operating command may request through the cognizant Bureau of Aeronautics Maintenance Representative an Overhaul and Repair Department Planner and Estimator to confirm the strike recommendation.

(2) When an aircraft is damaged or defective and determined by the operating command to be obviously beyond rework and it is not feasible to obtain the advice and recommendation of an O&R Department Planner and Estimator, the aircraft shall be reported as a Category One strike by the reporting custodian in accordance with existing instructions. In this case, the aircraft may be transferred to the nearest Continental U.S. Naval aeronautical activity for return to BuAer (M&S) custody and final disposition. If it is impracticable to remove the aircraft, the reporting custodian shall salvage or otherwise dispose of the aircraft in accordance with Aviation Supply Office directives. When a "strike" aircraft is transferred to a designated overhaul point for that model, it will be re-examined and if considered economical, a request shall be submitted to BuAer for reinstatement and overhaul. When such an aircraft is transferred to an overhaul point that is not designated for that model and doubt exists

concerning the feasibility of overhaul, disposition instructions shall be requested from the cognizant Bureau of Aeronautics Maintenance Representative. When final determination can be made, that overhaul is impracticable, salvage may be undertaken without further recourse. *Salvage normally consists of the removal of useful parts in accordance with existing ASO Parts Recovery Lists or to meet a known local requirement. Disposition of the remainder of the aircraft shall be in accordance with ASO directives.*

b. *Aircraft not obviously beyond rework.*

(1) If the work to be done on damaged or defective aircraft to restore the aircraft to an operational condition acceptable to a major operating command is within the capacity of a Class "C" maintenance activity, such work will be accomplished by the Class "C" maintenance activity with no change in controlling custody.

LIFT BAGS (Fed. Stock. No. R-1700-C03-1607-S030) have a lifting capacity of 12 tons, inflate to a height of 6 feet; a total of 8 bags are allowed stations supporting AJ, P2V, R4Q, R4D, R5D, R4Y, R7V or WV aircraft; 6 bags are in allowance lists for stations supporting A3D aircraft. The bags are inflated with a portable gas engine-driven pump/blower which has a capacity of 40 cu. ft. per minute at 5 psi. Tests indicate it takes 7 minutes to inflate each bag; 1 pump is allowed per set of bags.

(2) If the work to be done on damaged or defective aircraft to restore the aircraft to an operational condition acceptable to a major operating command is beyond the capacity of a Class "C" maintenance facility, the services of an Overhaul and Repair Department Planner and Estimator shall list on Form NavAer 2980 *all* work which is required to restore the aircraft to an operational condition acceptable to a major operating command. This information will be forwarded directly to the cognizant BAMR with a copy to the controlling custodian *and other activities as listed on Form NavAer 2980 (Rev 4-55).* Based upon the nature and extent of the damage, the estimated time out of service, and available Class "C" capacity, aircraft determined to be in a "repair" category shall be processed as directed by the cognizant BAMR. In determining the manner in which the aircraft will be processed, consideration should be given to the possibility of the Overhaul and Repair Department accomplishing all work required, including that work normally within the capacity and ability of a Class "C" activity, especially if the time out of service can thereby be shortened and the entire rework accomplished more economically.

(3) When aircraft can be repaired by an O&R Department and returned to the major operating command within 60 days, no permanent change of custody occurs and the aircraft shall be placed in "repair" status as defined above. If, subsequently, the aircraft is not returned to the major operating command within 60 days, then by mutual agreement between the major operating command and the O&R activity the aircraft may be transferred to the custody of BuAer (M&S). Likewise, such an aircraft will not be identified as in a "repair" status.

(4) Transfer of an aircraft to BuAer (M&S) controlling custody may be effected regardless of the location of the aircraft in the *Continental* U.S. The Naval aeronautical activity concerned with the physical custody or charged with the security of the aircraft shall assume the responsibilities of reporting custodian. If the aircraft is located at other than a Naval aeronautical activity, the appropriate Commander, Naval Air Bases shall designate the reporting custodian. When government transportation is available, BAMRs may arrange for disposition of aircraft to an overhaul point without recourse to BuAer. In those instances where movement by a commercial carrier is required, BAMRs, in submitting Report AerRep-MA-73 to BuAer (MA-2), shall include man-hours required to place the aircraft in a ready-

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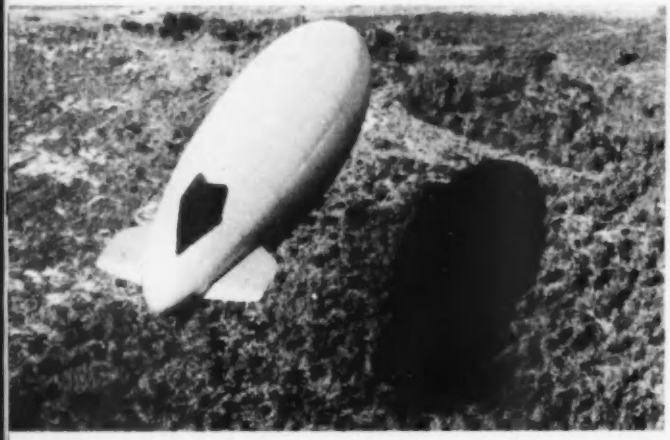
for-issue condition and transportation costs. Subsequent disposition will be directed by BuAer.

Lighter Than Air

Salvage or removal of wreckage is normally directed by the Commander Naval Air Bases of the district in which the mishap occurred. However, in the case of naval airships, the commanding officer of the operating unit often has technically qualified personnel to conduct airship salvage and removal. The commanding officer of the airship operating unit therefore assumes responsibility for the salvage or removal operation if it is within the unit's capabilities.—*OpNav. Inst. 3750.6C*



Procedures for Damaged Engines

JET ENGINES—*BuAer General Gas Turbine Engine Bulletin No. 38 of 12 Sept 55*

This is a directive to assure priority shipment and disassembly of gas turbine engines involved in crashes, accidents, or fires. It applies to all gas turbine engines which have been involved in salt water crashes, fires or accidents and requires compliance as soon as practical not to interfere with accident investigation.

Operating activities:

1. Immediately upon recovery of the engine after a salt water crash, or fire where foam or other chemical was used the following steps will be taken:

a. Remove engine from airframe.

b. Wash down engine thoroughly with hot fresh water, cold fresh water, or steam clean, internally and externally.

c. Preserve in accordance with GGTB No. 15 using Mil-C-972 Grade III, 52-C-18 Grade III or Mil-C-16173 Grade III for preserving engine interior, exterior and lubricating system.

d. Ship engine by most expeditious means to nearest overhaul activity for disassembly, cleaning and preservation.

Whenever jet engines are involved in fire, crash, accidents or incidents involving shock or stresses, instructions contained in GTEB 38 will apply.

2. *Immediately upon recovery of the engine after an aircraft accident or other incident where the engine may be damaged due to the shock and undue stresses imposed on it, paragraph 1c and 1d above will be complied with.*

3. Assure all engines are plainly marked for priority tear down and type of accident or damage.

Immediately upon receipt of engines O&R will induct into overhaul.

RECIPROCATING ENGINES—*General Reciprocating Engine Bulletin 139, Rev. C.*

This is the Inspection and Repair Guide. The following is excerpted as pertinent to salvage procedures:

1. *Sudden Stoppage:* The impact imposed during sudden stoppage shall be the criteria for further inspection, test and/or overhaul and classified as follows:

a. *Serious Damage:* Engines subjected to nose over, drop or sudden impact with foreign object. When an engine that has been running above 1200 RPM turns no more than 1 revolution of propeller shaft after propeller strikes a foreign object, the engine shall be inducted for overhaul.

b. *Minor Damage:* Engines subjected to minor shock loads that can be repaired locally and/or when gradual stoppage of a running engine results from propeller striking an object: If the propeller is bent or damaged beyond limits (even though it

Instructions governing damaged reciprocating engines are contained in General Reciprocating Engine Bul. 139, Rev. C.

didn't have actual sudden stoppage), induct the engine to overhaul for complete disassembly inspection. Otherwise, the engine shall be inspected and tested for possible damage as follows:

(1) Inspect propeller shaft for run-out.

(2) Rotate propeller shaft 10 turns to determine if any binding or unusual noises are detected.

(3) Inspect sumps and strainers for metal particles.

(4) Drain and refill oil system.

(5) Operate engine at 1200 rpm to 1400 rpm for 15 minutes with short bursts to 1800 rpm at 5 minute intervals. DO NOT exceed cylinder head temperature limit.

(6) Inspect sumps and strainers for metal particles.

(7) Operate engine at 1200 rpm to 1400 rpm, for one hour with short bursts to 1800 rpm at 15 minute intervals. *Do not* exceed cylinder head temperature limits.

(8) Inspect sumps and strainers for metal particles. If no discrepancies are detected, the engine will be approved for test flight.

(9) Repeat inspection of sumps and strainers at next 3 post-flight inspections. If no malfunctioning has developed, release the aircraft for unrestricted operations.

(10) Insure complete log book entries reflect the results of the above inspections and test.

Cannibalization

Cannibalized parts must be on a controlled basis. The removal of parts for use elsewhere is discouraged. Squadrons are not authorized to remove or exchange parts on damaged aircraft without prior approval of the cognizant ComFAirWing or MarAirWing. If authorized, then the nomenclature, part numbers and authority must be recorded in the log book.

Radioactive Tubes

Certain jet engines use spark gap tubes that contain radioactive material. These tubes contain radioisotopes of uranium; and if the spark gap tube is broken, they could present an internal health hazard.

Uranium, to be considered a health hazard, must physically enter the body. This may be accomplished by inhalation, ingestion, or allowing contaminated materials to touch an open wound such as a cut or scratch. Uranium is primarily an Alpha particle emitter and therefore does not constitute an external radiation hazard. This is true since Alpha particles only travel a few centimeters in air and generally do not penetrate the outer layer of skin.

Under normal circumstances, only skilled personnel will work on the ignition unit, and these individuals should be thoroughly familiar with the proper method of handling radioactive materials. However, anyone who handles engines or aircraft parts during or following an accident investigation should also be aware of the presence of a tube containing radioactive material and exercise caution whenever any doubt exists. Unnecessary handling of any potentially hazardous material is unwise.

It should be understood that there is no danger of radiation in normal handling of these engines or ignition units. However, in the event the spark gap tube is broken, all safety precautions for handling, storage, and disposal of such radioactive material should be observed.

If you are not sure if your jet engines have this spark gap unit, it is suggested that the engine manufacturer be contacted so that you can proceed to set up whatever procedures are required to handle these units safely.—*Air Transport Section, National Safety Council.*

Editor's Note: Handling precautions for radioactive spark gaps used in various Scintilla Jet Ignition Units are contained in General Gas Turbine Engine Bul. 53, dated 30 Aug. 1957. Among Navy jet engines equipped thusly are certain models of J57, J65, J69 and

Continued from preceding page

J79. Figure 1 illustrates four different styles of radioactive spark gaps currently used.

Radioactive materials are also contained in quite a number of tubes in radar equipment, fire control systems and guided missile systems. These tubes fall in three classes: 1. ATR and TR (transmitter tubes). 2. Glow Lamps or Cold Cathode Tubes. 3. Spark Gap Tubes. **Caution: Radioactive tubes cannot be readily identified. Do not handle any broken tube without taking the precautions outlined below.**

- *No material contaminated by radioactivity should be allowed to come in contact with any part of the body at any time. Rubber or plastic gloves should be worn at all times when the handling of radioactive wastes and broken radioactive parts is involved.*
- *No food or drink should be brought into the contaminated area.*
- *Immediately after leaving the contaminated area, personnel handling radioactive material in any way should remove any clothing which may have become contaminated and wash hands and arms thoroughly with soap and water, especially before eating or smoking.*
- *Disposal of radioactive material must be made in accordance with BuShips instructions contained in OpNav 34P1, Chapter 19, U. S. Navy Safety Procedures.*

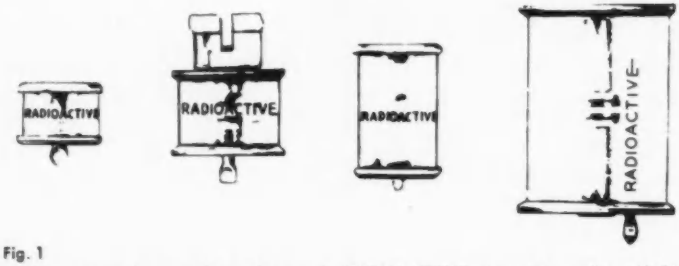


Fig. 1
Radioactive spark gaps have the word "RADIOACTIVE" stamped on the cylindrical glass surface of the gap and/or a white dot on the internal surface of the glass.

Salvagers must be extremely careful not to destroy any evidence; bits and pieces can provide clues as to the cause sought by crash investigators.

Scientific accident investigation has led to fewer "undetermined" type aircraft accidents.

References:

(1) NavAer 00-80T-67 (Handbook for Aircraft Accident Investigators).

(2) OpNav Inst. 3750.6C (Navy Aircraft Accident, Incident and Ground Accident Reporting Procedures).

(3) NavAer 00-80R-14 (U. S. Navy Aircraft Fire Fighting and Rescue Manual).

(4) NavAer 00-80C-501 (Procedure for Aircraft Crash Fire Fighting and Rescue).

(5) Instructors Guide for the Use of Visual Training Aids for Aircraft Fire Fighting and Rescue (Navy Contract N600(A) 44227).

(6) BuAer Inst. 113204, Firefighting and Rescue Training Course, Outline of.

(7) BuAer Inst. 00.99 Disposition of Salvaged Materials.

(8) BuAer Inst. NavAer 00.38A. Terminology, definitions and policies regulating work on or rework of naval aircraft.

(9) NavAer 15-01-500 (Handbook, Preservation of Naval Aircraft for Shipment and Storage).

(10) BuAer Inst. NavAer 02.6C. Aircraft engines; classification, disposition policy, and procedures for determining disposition by striking.

(11) General Gas Turbine Eng. Bul. No. 38.

(12) BuAer Gas Turbine Eng. Bul. 53

(13) General Reciprocating Eng. Bul. No. 139, Rev. C.

(14) OpNav Inst. 544.2.

(15) OpNav Inst. 03110.11C.

(16) ComNavAirLant Inst. NavAer 00.17.

(17) ComNavAirPac General Aircraft Maintenance Bul. 34.54.

(18) Film MN 8270 Aircraft Accident Investigation.

(19) ASO Catalog (Class-89) Salvage Equipment.

(20) OpNav Inst. 3710.7A.

(21) NavAer 15-01-500 Section XII.

(22) APPROACH articles:

(a) "Finders Keepers," May 1955, page 6.

(b) "Something From Nothing," June 1956, page 5.

(c) "Skid Row," July 1956, page 35.

(d) "Columbus Was Here," March 1959, page 30.

2 When the engines of P2V-5F were started the starboard strut which was fully extended before turn up, dropped with a severe jolt to almost the low extremity. The aircraft, which was not chocked, moved forward striking the NC-5B first with the nose wheel and then the port prop.

FROM THE GROUND UP

DAMP DRAG—After a normal landing the drag chute of an A3D-2 failed to deploy when the switch was actuated. The hytrol brakes were applied but failed to function and no braking action was experienced. The pilot dropped the arresting hook and the aircraft was stopped by the field arresting gear.

The cause of the drag chute failure was the freezing of a damp drag chute in the drag chute compartment. The dampness of the drag chute resulted from the aircraft with the chute installed being exposed to heavy rains and high humidity for four days prior to the incident.

The hytrol brakes failed as a result of improper installation and inspection. The A lead (recovery signal) and D lead (ground to recovery and skid relay) were reversed during installation causing a constant recovery signal to be sent to the hytrol

skid detector after the first skid signal was received.

Analysis

Trouble started with the failure of the chute to deploy. In this instance the pilot chute deployed, but the main chute did not. About 15 minutes later the drag chute dropped from the aircraft, slightly damp. It is believed that dampness accumulating over a 4 day period caused the chute to freeze up at altitude.

The wiring defect in the hytrol resulted from failure to follow the squadron's established inspection procedures. These include a continuity check of the leads and a wheel spin test with a man in the cockpit to observe proper functioning of the anti-skid light. Either check should have revealed the error. The possibility of error is increased by the fact that the "A" and "D" wires are the same color and there is no lead marking or numbering on the last 5 feet of these wires.

Once the pilot realized he had no braking action, he could have regained brakes by simply turning off the hytrol switch. Not until the aircraft had stopped did he note that the hytrol warning light was burning steadily.

Corrective Action

In the future, drag chute will be installed just prior to the preflight inspection. This will ensure that the chutes are kept dry during adverse weather conditions.

All maintenance personnel have been briefed on this incident and the electricians thoroughly understand the errors made. To prevent such errors, the squadron recently established a six man inspection team specifically charged with quality control of maintenance work.

All leads to the hytrol skid detectors will be tagged for ready identification.

Immediately after this incident, a complete analysis was made for the benefit of all pilots. Points covered included the following:

a. The landing is the most critical phase of the flight. Prior to touchdown, the pilot must review in his mind the emergencies most likely to occur and the proper sequence of events in each case.

b. In case of brake failure the sequence of events should be:

(1) Hook down

(2) Hytrol switch off

(3) Emergency hydraulic pump on

(4) Attempt braking. Remember that with hytrol off brakes must be used continuously.

(5) Prepare to use emergency air brakes if necessary.

c. The necessity of keeping emergency procedures clearly in mind for both takeoffs and landing was emphasized.

EASY DOES IT—A mechanic was making the final runup on an FJ-4 in the final stages of its first intermediate inspection. After the engine had run about 30 minutes the mechanic switched to MANUAL FUEL CONTROL for a normal check of the Manual Fuel System. While the switch was still in MANUAL the mechanic moved the throttle rapidly from IDLE to FULL POWER. On acceleration, at 85% the power engine exploded. About three feet of the aft section of the tailpipe was blown 30 feet aft of the aircraft. Fire ensued in the after section of the tailpipe. The aircraft sustained major overhaul damage (see photo below).

The primary reason for this accident was a compressor stall caused by rapid movement of the throttle while in manual fuel control. Although runup instructions include "acceleration to 100% from 80%, 70%, 60% and IDLE," this means "increase in speed" rather than "rapid movement." When the engine caught fire, the mechanic left the aircraft with the throttle in IDLE, the engine master switch and battery switches ON. The fire was aggravated by the operator's failure to shut down the engine.

Recommendations resulting from this accident included schooling of runup personnel in the Operational Flight Trainer for both normal and emergency procedures. The following will be stressed:

- Fundamentals of Jet Engines
- Fundamentals of Jet Fuel Controls
- The engine runup check sheet
- Emergency procedure including emergency shutdown.

Ventral areas on both sides of the tail section were burned through. The tail cone was burned off. The tailpipe was burned off from the turbine to the last three feet which was blown clear of the aircraft. The after piece of tailpipe and the shroud were torn and twisted. The turbine blades were burned off and the engine was frozen.

Continued from preceding page

WHEEL FIRE FIGHT—Pilot was taxiing F9F-6 aircraft to become familiar with ground handling characteristics. After two runs up and down runways, this pilot started to return to parking ramp. The pilot felt a thump and the port wing dropped. Assuming that he had blown a tire, he stopped. He then noticed smoke coming up from the trailing edge of the port wing. Pilot made three transmissions to the tower for a fire truck.

Pilot then shut engine and abandoned aircraft. After an estimated 2 minutes from the time tower received initial transmission, the crash trucks arrived on the scene. Both starboard and port brake assemblies were ablaze and burned vigorously until extinguished by the station crash crew. Compatible dry chemical for brake fires was used to extinguish the flames initially. Fire broke out repeatedly in both brake assemblies. After the supply of dry chemical was exhausted, (four 30-lb. containers), TMB and finally foam was used to extinguish the flames permanently.

JET POD FIRE FIGHT—While attempting to start the starboard jet engine of a P2V-7 prior to takeoff, a hot start resulted in TOT of 910° C for several seconds but stabilized at about 550° C. Several seconds later the RPM increased to 100% without any throttle movement. The throttle was immediately moved to OFF and fire commenced shooting out both ends of the starboard jet. A run was made down the runway in an attempt to blow the fire out. During the run the jet throttle was moved to the standby position to keep the pod doors open to keep the airflow moving through the engine. The fire appeared to go out and the aircraft was turned off onto another runway, stopped, and was met by the fire truck. The afterstation lookout took a CO_2 fire bottle and stood by the starboard jet. Shortly after the aircraft stopped flames again leaped out. The CO_2 bottle was discharged into the jet tail section. The pilot at this time secured all fuel to the starboard side of the aircraft and the fire truck discharged CO_2 into the jet tail section and then threw in dry powder successfully stopping the fire.

The primary cause of this jet engine fire was a malfunctioning micropositioner in the remote electric throttle positioner system control box (Part No. CYLZ 4246-1). As soon as power was applied to the aircraft faulty operation of the micripositioner positioned the jet pod throttle (Part No. KYLC 4248) to the 100% rpm position. When the cockpit jet throttle was moved to the standby position, the fuel gate valve opened allowing fuel to pass through the jet fuel control unit into the combustion chamber under low transfer-boost pump pressure. When the ignition circuit was activated, the excess fuel in the combustion chamber caused the engine fire.

Corrective action: Squadron has since changed its operating procedure to immediately execute fuel starvation to the jet engine on any ground start jet engine fire.

Attention is invited to the fact that collapsed fuel lines have been found on many Turbo-Jet engines that have experienced fuel starvation due to shutting off of fuel to the engine. When an engine is shut down in this manner it is recommended that all fuel lines from the point of shut down to the engine be thoroughly inspected for parting of the inner rubber wall of the fuel line from the outer wall.

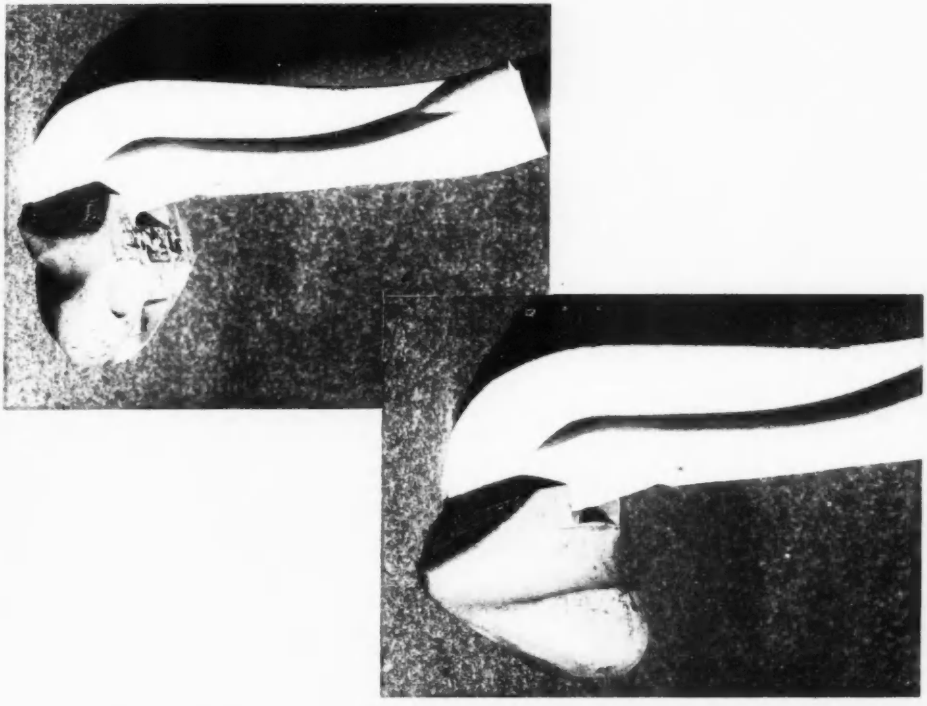
SLICK TRICK—During a hard landing of a ZS2G-1 airship the tire was blown and forced over on the starboard rim of the wheel. The exposed port rim of the wheel disintegrated as a result of direct contact with the asphalt mat. The ship was slowed down and the lines taken in hand by the line-runners to hook up to the ground handling mules. Turbulence from the hangar had an adverse effect upon the airship and made it difficult to accomplish a hook-up to the mules.

At this time the Ground Handling Officer determined a wave-off was necessary as the airship was not well in hand. After becoming airborne, an inspection of the complete landing gear assembly was made by the flight crew with the gear retracted and the damage was determined to be blown tire and broken wheel. Normally under these circumstances a high, light landing would be effected and an emergency wheel installed to handle the airship on the deck.

To eliminate the uncertainties often associated with a high, light landing under these circumstances, the airship was ordered to rig for in-flight rearming. The rearming procedure was utilized inasmuch as this was the only method available by which a wheel assembly could be introduced into the bomb-bay due to its size and shape. No difficulty was encountered by the airship in hoisting the wheel assembly aboard.

Subsequently the bomb-bay doors were closed; the bomb-bay door circuit breaker pulled, and two men with life lines attached descended into the bomb-bay, removed the broken wheel and tire and installed the new assembly in about 20 minutes. The gear was then extended and a normal landing made without further incident. ●

MURPHY'S LAW*



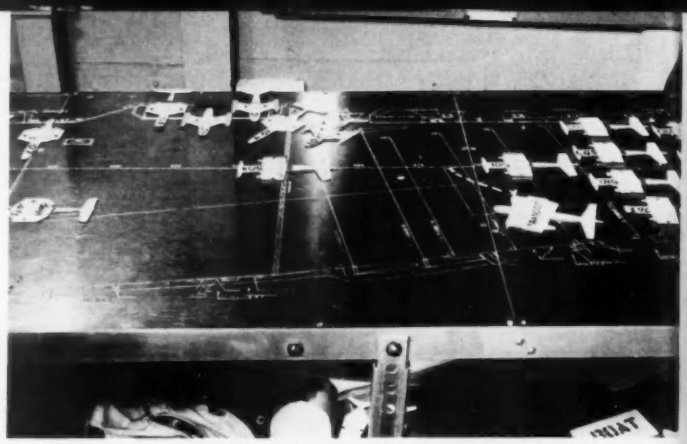
A recent FLIGA report involving an F11F-1 tells of a pilot who made five mirror approaches to the deck of his carrier but was unable to engage a wire for arrestment. He was diverted to a field on the beach where he landed without further incident.

Investigation revealed the hook point was installed backwards during the night preceding the flight (left photo). The investigating board said the occurrence resulted from Murphy's Law,* improper inspection, and maintenance crew fatigue.

This incident reemphasizes the need for proper training, supervision and inspection procedures. The reporting command is requiring that the arresting hook be dropped for visual inspection during the pilot's preflight.

**If an aircraft part can be installed incorrectly, someone will install it that way.*

Clipboard



Take a Tip—Flight deck accident reporting is simplified through the use of a camera and the flight deck spotting (ouija) board.

Safety Gimmick

A flying safety gimmick employed by the Link trainer department of the 1616th Support Squadron, EASTAF, shows possibilities for general use. The section devised a "Problem of the Month" in which all pilots are invited to participate. Results of the flight are graded and kept secret by the Instrument Training Section. At the end of the month, the winner's names are published, as well as the number of pilots who "spin, crash and burn" attempting to fly the problem.—*MATS Flyer*

So Near, So Far

AT low altitudes it's sometimes frustrating to find you're having trouble communicating with an omni station that you can actually see. Some pilots don't realize that there are 'remoted' omni stations which are controlled from points up to 40 or so miles away. In most such cases, the transmitter is located at the omni station and is connected to the manned ground station by telephone line, but the receiver is situated "just over yonder hill," beyond line-of-sight VHF range.

—*AOPA*

Prescription Sunglasses

THE following item is quoted in part from the Medical News Letter of 20 March 1959:

"Requests for prescription sunglasses are being received in accordance with BuMed Instruction 6810.4 of 18 June 1958, and the item in the BuMed News Letter of 19 Dec. 1958. A review of the status of the funds for the procurement of this item has revealed that sufficient funds remain in the Fiscal Year 1959 budget to provide prescription sunglasses for naval aviators and for a number of aircrewmen and other flight deck personnel. Requests previously denied for aircrewmen should be resubmitted.

"Attention is invited to the availability of occupational bifocal sunglasses which have a second segment at the top of the lenses of particular value to presbyopic aviators for viewing overhead instruments and radio controls."

Answers to puzzle page 23

1 L	2 O	3 F	4 T	■	5 V	6 G	■	7 I	8 X	
9 I	F	R	■	10 T	A	C	11 A	N	■	
12 T	T	■	13 V	S	■	14 A	L	C	■	
E	■	15 T	O	T	■	■	16 T	A	D	
R	■	17 P	O	M	18 O	19 L	A	■	O	
■	20 E	T	D	■	21 M	A	R	■	N	
22 P	A	■	23 O	M	N	I	■	24 N	O	
■	25 T	R	O	D	I	■	26 A	A	R	

Attention A4D Jockeys!

REPORTS indicate a number of A4D accidents have been caused by starting the aircraft with the gear handle in the UP position. The instructions say that the only time the gear handles should be up, when not in flight, is during landing gear operational check while aircraft is on jacks.

Misuse Of Guard

ROUTINE use of Guard channel continues to be a problem. But a recent survey indicates that military pilots are responsible for only a small part of the misuse of guard. The CG of 2nd Marine Air Wing ordered his pilots to report all violators heard within a two-month period. Offenders are as follows:

Center and Departure Control	32
GCI Sites	12
Military Tower	4
Other CAA Agencies	15
Military Aircraft	4
Military Control Agencies	14
Unidentified & Miscellaneous	20

Of the 101 violations, 43 were military violations. But only 4 of these were by pilots. Of course, of the violators listed as unidentified, it is reasonable to assume that some are military pilots. Even then it can be seen that pilots are not the worst violators.

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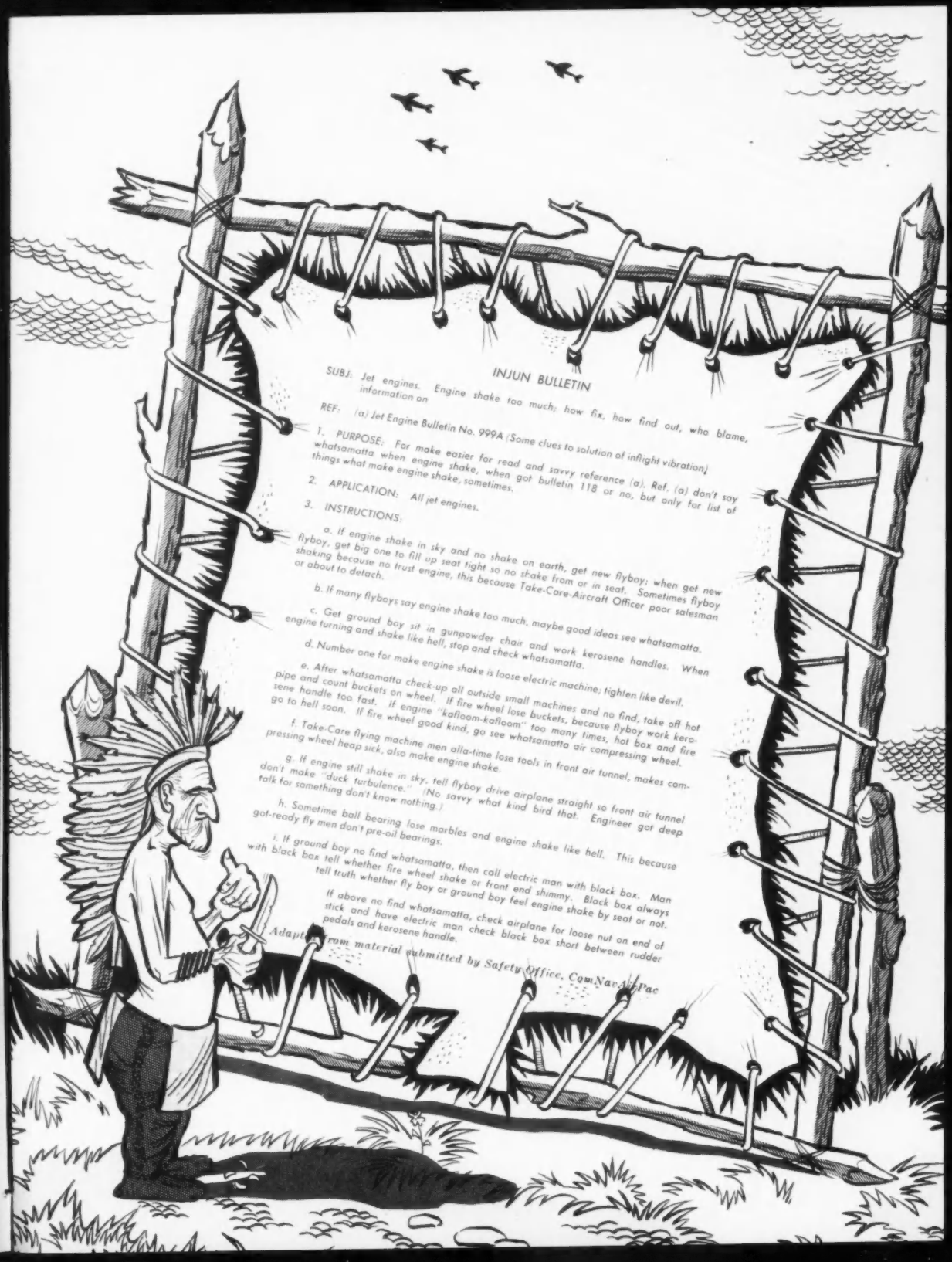

INJUN BULLETIN

SUBJ: Jet engines. Engine shake too much; how fix, how find out, who blame, information on

REF: (a) Jet Engine Bulletin No. 999A (Some clues to solution of inflight vibration)

1. PURPOSE: For make easier for read and savvy reference (a). Ref. (a) don't say whatsamatta when engine shake, when got bulletin 118 or no, but only for list of things what make engine shake, sometimes.

2. APPLICATION: All jet engines.

3. INSTRUCTIONS:

a. If engine shake in sky and no shake on earth, get new flyboy; when get new flyboy, get big one to fill up seat tight so no shake from or in seat. Sometimes flyboy shaking because no trust engine, this because Take-Care-Aircraft Officer poor salesman or about to detach.

b. If many flyboys say engine shake too much, maybe good ideas see whatsamatta.

c. Get ground boy sit in gunpowder chair and work kerosene handles. When engine turning and shake like hell, stop and check whatsamatta.

d. Number one for make engine shake is loose electric machine; tighten like devil.

e. After whatsamatta check-up all outside small machines and no find, take off hot pipe and count buckets on wheel. If fire wheel lose buckets, because flyboy work kerosene handle too fast. If engine "kafloom-kafloom" too many times, hot box and fire go to hell soon. If fire wheel good kind, go see whatsamatta air compressing wheel.

f. Take-Care flying machine men alla-time lose tools in front air tunnel, makes compressing wheel heap sick, also make engine shake.

g. If engine still shake in sky, tell flyboy drive airplane straight so front air tunnel don't make "duck turbulence." (No savvy what kind bird that. Engineer got deep talk for something don't know nothing.)

h. Sometime ball bearing lose marbles and engine shake like hell. This because got-ready fly men don't pre-oil bearings.

i. If ground boy no find whatsamatta, then call electric man with black box. Man with black box tell whether fire wheel shake or front end shimmy. Black box always tell truth whether fly boy or ground boy feel engine shake by seat or not.

If above no find whatsamatta, check airplane for loose nut on end of stick and have electric man check black box short between rudder pedals and kerosene handle.

Adapted from material submitted by Safety Office, ComNavAirPac

▶ *Speed Trap*

The facts about Navy runway arresting gear experience.

▶ *Tag–You're It!*

When is a flight violation a FLIGHT VIOLATION?

▶ *Had Gun . . .*

More on an age-old subject, wheels up landings.

▶ *One Summer Evening*

A survival yarn of utmost interest.

▶ *Strikes and Spares*

The problems and procedures in recovering crashed aircraft.